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Canada, Parliament, Senate, Committee
Special Committee on Science Policy,
Proceedings



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First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE

★ SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 31-45

WEDNESDAY, FEBRUARY 26th, 1969

WITNESSES:

Department of Indian Affairs and Northern Development: J. A. MacDonald, Deputy Minister; D. A. Munro, Director, Community Affairs Branch; C. I. Fairholm, Director, Policy, Planning and Programming; A. H. MacPherson, Regional Supervisor of Research, Canadian Wildlife Service; and A. J. Kerr, Chief, Northern Science Research Group.

APPENDIX:

32.—Brief submitted by the Department of Indian Affairs and Northern Development.

THE QUEEN'S PRINTER, OTTAWA, 1969

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird
Belisle
Blois
Bourget
Cameron
Carter
Desruisseaux
Giguère

Grosart
Haig
Hays
Kinnear
Lamontagne
Lang
Leonard
McGrand

Nichol
O'Leary (*Carleton*)
Phillips (*Prince*)
Robichaud
Sullivan
Thompson
Yuzyk

Patrick J. Savoie,
Clerk of the Committee.



ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yusyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,
The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,
The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Wednesday, February 26th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Bourget, Grosart, Haig, Hays, Kinnear, McGrand, Robichaud and Sullivan.—10.

Present but not of the Committee: The Honourable Senator Gladstone.—1.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

J. A. MacDonald, Deputy Minister;

D. A. Munro, Director, Community Affairs Branch;

C. I. Fairholm, Director, Policy, Planning and Programming;

A. H. MacPherson, Regional Supervisor of Research, Canadian Wildlife Service; and

A. J. Kerr, Chief, Northern Science Research Group.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 32:

—Brief Submitted by the Department of Indian Affairs and Northern Development.

At 12.30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

MacDonald, John Allan, Mr. MacDonald was appointed Assistant Deputy Minister (National Resources) of the Department of Northern Affairs and National Resources on January 13, 1964, Senior Assistant Deputy Minister of the reorganized department on January 1, 1966, and Deputy Minister on March 1, 1968. Born in Ottawa August 23, 1921, he received his early education in that City. At the outbreak of war, Mr. MacDonald joined the Canadian Army and served in Canada and the United Kingdom. In 1947 he graduated from McGill University with a Bachelor of Arts degree (honours) in Economics and took a position with the Industrial Development Bank in Montreal. In 1949 he joined the Economic Policy Division of the Department of Finance where he remained until his appointment to the National Defence College in Kingston in 1954. On his return to Ottawa he joined the staff of the Treasury Board to work on defence budget problems. He was appointed Director of the Defence, Works and Contracts Division of the Board in 1958, and two years later was named Assistant Secretary of the Treasury Board where he was responsible for the work of the Board outside the personnel policy field. In January 1963, Mr. MacDonald was seconded to be Assistant Deputy Head of the Bureau of Government Organization—the task force set up to study the recommendations of the Royal Commission on Government Organization. Mr. MacDonald is Chairman of the Northern Canada Power Commission; member of the Board of Directors of the Panarctic Oils Ltd., and Oromocto Development Corporation; member of the Advisory Council of the School of Public Administration of York University, the Canadian Political Science Association, the Cercle Universitaire, the Canadian Club, and the Country Club. He is also a member of the Advisory Council—Federal Institute of Management. He is married to the former Jean Elliott Wright; they have three children, Ian, David and Kathy.

Munro, David Aird—Director—Canadian Wildlife Service. Date and Place of Birth—May 25, 1923. Victoria, B.C. Parents—James A. Munro and Alice Olive Bunting, Canadians of Scottish and English stock. Family—Married Harriet Ellis of Caerwys, Flintshire, Wales in 1943. Children—4 sons. Education—Elementary and High School in Vernon, B.C. University of British Columbia, 1940-42; 1946-47. University of Toronto, 1947-48; 1950-51 taking graduate studies in Zoology and Land Utilization. Degrees Obtained—B.A., University of B.C., Honours Zoology, 1947. Ph.D., University of Toronto, 1956. Employment—Summer 1946—British Columbia Game Commission, student assistant in Zoology. Summer 1947 and May-June 1948—Canadian Wildlife Service, student assistant in Zoology. July 1948 — July 1953—Canadian Wildlife Service, Wildlife Management Officer (Vancouver) July 1953 — April 1962—Canadian Wildlife Service, Chief Ornithologist April 1962 — Dec. 31, 1962—Canadian Wildlife Service, Staff Specialist—Ornithology Jan. 1, 1964 — April, 1966—Chief—Canadian Wildlife Service April, 1966 — Sept. 1968—Director—Canadian Wildlife Service Sept. 1968 — Present—Director—Community Affairs Branch War Service—Royal Canadian Air Force, Radar Mechanic, March, 1942 to October, 1945, overseas service—United Kingdom.

Fairholm, Cyril Irvin—Director—Policy, Planning and Programming Social Affairs Programme Department of Indian Affairs and Northern Development. Following graduation from Queen's University, Kingston, Ontario, joined the Indian Affairs Branch in 1949 as an administrative trainee and subsequently served as an Administrative Officer, Executive Assistant to the Director, Senior Administrative Officer, Head of the Secretariat and Head of the Policy and Planning Directorate.

MacPherson, Andrew Hall, B.Sc., M.Sc., Ph.D., Science Adviser, Science Council of Canada. Born June 2nd, 1932, London, England. Canadian Citizen. Lived in St. John's, Newfoundland, Westmount and St. Sylvère before moving to Ottawa 1945. Attended Carleton College, Ottawa, (B.Sc.) 1954 and McGill University, Montreal, (M.Sc.) 1957 and Ph.D. 1967. Participated in summer expeditions to Canadian Arctic 1949, 50, 51, 52, 54, 55, 56, 57 and 58. In 1958 joined Canadian Wildlife Services as Wildlife Biologist. Conducted studies on Canadian arctic fox populations in Kéewatin and Franklin 1959-63. Appointed research supervisor, Eastern Region, Canadian Wildlife Services 1963. Also Project Leader, Manitoba-Keewatin Barren-ground Caribou Study, 1966-67. Seconded to Science Secretariat, Privy Council Office, 1967, and Science Council Staff, 1968. Author of 35 scientific publications. Married May 8th, 1957 to Elizabeth Menzer: two sons.

Kerr, A. J. 1921—Born in Edmonton, Alberta. Married Eleonar Robinson, Dec. 1943—5 daughters. 1939—Senior Matriculation—Ridley College, St. Catharines, Ontario. 1940 - 1942—General Arts, University of Toronto. 1942 - 1945—R.C.A.F. (Operational experience as Navigator—Bomb Aimer, 128 Squadron, No. 8 Pathfinder Group, Bomber Command, R.A.F.). 1945 - 1947—Completed honour course in Sociology—University of Toronto. 1947 - 1948—Anthropological field study on food habits among the Indians of Ruperts House, P.Q., for the Canadian Committee for Community Health Studies. 1948 - 1949—Completed M.A. course in anthropology, University of Toronto. 1949 - 1951—Varied employment including work with juvenile delinquents in Toronto. 1951 - 1952—Teacher training at Ontario College of Education, Toronto. 1952 - 1961—Community Principal, Aklavik, N.W.T. 1961 - 1962—University of London—studied Community Development and Education. 1962 - 1964—Returned to Aklavik as school principal and departmental co-ordinator in the settlement. 1964 - 1965—Academic Advisor to Director, Northern Administration Branch. 1965 - 1967—Senior Research Officer, Northern Co-ordination and Research Centre. 1967 - Present—Chief, Northern Science Research Group.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, February 26, 1969.

The Special Committee on Science Policy met this day at 10 a.m.

Senator Maurice Lamontagne (*Chairman*) in the Chair.

The Chairman: Honourable senators, this morning we will hear from the representatives of the Department of Indian Affairs and Northern Development. The delegation is headed by Mr. J. A. MacDonald, who was appointed fairly recently as Deputy Minister of the department, which was my first assignment as a civil servant about 15 years ago, when the department was quite different from what it is now.

We are very pleased, Mr. MacDonald, to have you and your delegation with us this morning. I might ask you, without further introduction, since all your biographies have been circulated already, to make an opening statement.

Mr. J. A. MacDonald (Deputy Minister, Department of Indian Affairs and Northern Development): Thank you, Mr. Chairman, senators. I might follow on the Chairman's remarks by noting that I have just been appointed recently and I am theoretically defending a brief about a structure which is of a long standing period. If the foundation is somewhat shaky, the Chairman's remarks about his participation at an earlier date will account for the rather slow start, possibly.

I would like to just sketch a few remarks to do what we found it rather difficult to do at the time the brief was being prepared. Because of the fairly scattered responsibilities, which I will touch on later, of our department, we have a very great involvement in many areas of research of one kind or another. The questionnaires elicited a fairly voluminous reply and it inclines to be somewhat segmented.

I would just as background therefore, like to talk a bit about the roles of the department and the unity or theme that lies in it.

We are in effect a department of, which for want of better words we describe as, trust responsibilities, for people or resources, for today and for future

generations. You will see that this is true, that what on the base of it appear to be quite disparate responsibilities do have a unifying theme.

More formally the department is divided into three broad areas of program responsibilities: Conservation; economic development; and social affairs. We have just re-organized into that context. Prior to this the programs were: Conservation; Northern and Indian, but we have adopted this functional approach in order to address ourselves to some of the problems that are really involved in approaching the objectives that statutes or the government have laid down for us.

In the conservation side, to refresh your memory somewhat, we are responsible for the maintenance and development of the national parks system, the historic sites system and the Canadian Wildlife Service. The importance of this area is difficult to overstress. It is sometimes one that in our busy society gets overlooked as we press on with many of the things which are regarded as progress, but with sometimes little regard until too late as to the cost in our environmental qualities and other matters which this sometimes brings about.

So the program of setting aside some of the physical phenomena of this country for preservation for all time, the preservation of the species for ourselves and for our future generations and the preservation of our historic past are elements of considerable national significance.

Under economic development we touch on areas which are of equal importance; it is difficult to set out the order of priority. In this area we have the economic development of the north, that is the area which lies north of the 60th latitude. It is somewhat in the order of 38% of the land mass of Canada. It probably has that percentage, or better, of the future wealth of Canada, largely in terms of the extractive industries.

I am sure you are all aware of the great oil play that is going on in that area, which is of fairly recent origin, but one which geologically we have known about and have been pressing toward for some time, but which is now receiving more public attention and, of course, we have a considerable development

even now in the metals area. Pine Point, Anvil, and many others are names well known, and the future is even greater.

In the same area we have our people in programs responsible for the economic development and enlarged employment opportunities for native people, Indians and Eskimos.

While in absolute economic terms this does not rank with the economic development of the north, in social values, in sensitivity it does and, of course, today with Canadian society very much aware of this problem, this is an area of critical importance in the field of social affairs.

In this latter area we touch on the remainder of the problems of native people in this country whose sensitivity and significance I have just referred to and we here are involved in a vast educational program, either directly or indirectly, social welfare programs of particular difficulty and fairly experimental programs called by several titles, community development in the non-physical sense and as well in the physical sense.

This is in a broad way the panorama of the departmental range of programs.

As I referred to earlier, we have re-organized recently; we have as a department of government, quite apart from our program objectives been endeavouring in what you might call the post-Glassco philosophy to be in the forefront of the development of techniques for effective management within the public service and we feel we are achieving some success in this regard.

In this connection a very necessary companion to these endeavours is in the area of scientific research; input of this nature is vital for our operational effectiveness. It helps to identify needs and it helps to evaluate the effectiveness of programs. We find it therefore present in almost all of our areas of endeavour; in some places as tools, in other areas almost the entire program is in effect a form of scientific research.

I have already noted the diverse responsibilities of the department. These many and varied responsibilities require an involvement of a wide range of scientific and quasi-scientific disciplines. These range from engineering and geology through biology and its sub-disciplines to economics, sociology and anthropology.

One of the arts of organization in this department is to in fact effectively bring these various disciplines to bear upon common problems.

The implications of this range of scientific input needs are the development of several specialized

research capacities within the department in fields where the required specialists are in limited supply. I could quote examples of wildlife management, biologists, historic archaeologists and applied anthropologists, the supplies of which are extremely limited in this country and elsewhere. Correspondingly, and wherever appropriate, we make extensive use, and it involves extensive use, of contractual arrangements to supply scientific input in fields in which this seems appropriate.

I would like to just touch again on a few other aspects of our concern for the preservation of environmental quality. This is of particular significance to the parks branch and the wildlife service.

Although, happily, there is now increasing public concern and interest in the subject, it is nonetheless true that the characteristics of quality environment have never been clearly and comprehensively defined. Among other things we would believe they must be related to ecological variety and optimum capacity for regeneration of the life components of environment; standards of freedom from pollution; norms of erosion and water flow.

Now, many of these aspects individually have had public attention and much research and study, but I think there is a growing awareness pointing to the fact that most of the physical elements of the environment have been studied in relation to productive enterprises but not as part of an inter-locking system of which man is an element and with a conscience of what man in the pursuit of other objectives can and is doing to his own environment and a measurement of the weight of the consequences as against the other objectives.

One of the future objectives of the conservation program will be to undertake the research necessary from the point of view of our particular responsibilities, to define the characteristics of a quality environment from the human point of view.

The purpose, of course, will be to orient whatever we do for maximum achievement in this regard.

I would remind the committee of the importance attached to this in the speech from the throne of September 12, 1968, where a reference as follows was made:

The growth of our population and changes in the nature of our mobile urban and industrial society lend a new importance to conservation in its traditional sense.

Our conservation program relates heavily to this interpretation of conservation in its traditional sense.

Finally I would like to touch slightly on the dimensions of our responsibilities and related research in the economic, educational and social fields.

On the economic side, research here is related, self-evidently, to the economic development of the north and of Indian lands. I do not think I need to elaborate too much on that; I have indicated the scope and the scale of our responsibilities here.

The north particularly has some unusual challenges in economic engineering and economic development of Indian and Eskimo people has equally unusual challenges of a very different nature.

In the educational field, research here is concerned with the improvement of educational ways and means to prepare Indian and northern people for full participation in the Canadian community. In addition in other words to having to operate a very large educational plan we are doing so under some interesting and very severe educational challenges of language and cultural differences.

On the social side, research here is concerned with the identification and investigation of social factors that inhibit the full participation of native peoples in the Canadian community. These factors are very real and require a disciplined approach to them.

I would like to conclude by making a reference to your committee's press release of March 11, 1968, which read as follows:

We should now realize that in the new society change in growth must be promoted and stimulated to an even greater extent than in the immediate past. The key role on this front will be played by the physical and the live sciences, but it is at least as important for us to learn that we will not succeed in organizing change in affluence and in adjusting to that if the human live sciences and the social sciences are not in a position to make their full contribution in this respect. In other words, if we want to preserve our promise in the economic future and to prevent it from becoming catastrophic to our society and our people we desperately need a dynamic three dimensional scientific policy covering the physical, live and social sciences.

We heartily endorse this view and I think we find in our department probably more than many others not a deep involvement in any one of these areas but a continuing interplay among all of them.

Thank you very much, gentlemen.

The Chairman: Thank you, Mr. MacDonald. Now, we will have our usual discussion; Senator Belisle will initiate it.

Senator Belisle: Thank you very much, Mr. Chairman and Mr. MacDonald. The committee is aware that your department has recently undergone a major reorganization and appreciate that this has made it very difficult for you to prepare a brief.

Taking note that the title of your department is Indian Affairs and Northern Development, I propose to concentrate initially on the northern development aspect, not because I consider this has a priority over the important aspects associated with Indian Affairs, especially when I have on my left the honourable senator who represents this great part of our population, but rather because I think that science and technology might have a clearer role with regard to northern development.

Certainly I think I speak for all members of this committee when I say that the application of science and technology to the northern part of our north might well have high priority in Canadian science policy.

Report No. 4 of the Science Council, and I quote, Towards a National Science Policy for Canada, comments on the economic development of Canada's north as follows:

If this vast area is to be developed and its resources fully tapped, much more has to be done. Science has much to offer in the quest to make sure that the full economic potential of Canada's north is realized and that the cultural life of the population of this area is enriched.

Since you mentioned, Mr. MacDonald, in your opening remarks that you were in a sense a department with trust responsibilities, I would like to have some clarification regarding the priorities which have been set in the past and some indication about your new and most recent organization and the method of establishing priorities?

Mr. MacDonald: Senator Belisle, I think you implied yourself in your opening remarks it is very difficult to set absolute priorities, not only in this department but probably in the government as a whole.

Our responsibility is to see that we apply adequate resources to the several areas of our responsibility in a way that would optimize the return, if I may use that expression, whether in scientific value or such other values as may be involved. There can be no question whatsoever that the economic and social development of the north is of paramount importance, or at least of great importance to Canada.

It is important on at least two grounds; one I intimated in my opening remarks, that encompassing 38% of the land mass of Canada and probably greater than that proportion of its future wealth it is self-evidently important that what happens to it is important to Canada in selfish terms of the future well being of our country in material terms.

Its development, however, is also important in terms of the people who reside there and in particular the native people, the Eskimos, whose traditional way of life is disappearing for a variety of reasons and for whom some alternative life, a meaningful life has to be found.

The north as well offers extraordinary challenges of a scientific and technological nature, to cite only some fields such as transportation, which is one of the keys to economic development of the north. Energy sources is another. Similar challenges for scientific research lie in the sociological side, because the development and maintenance of communities in that area will present unusual challenges, possibly less so in the Yukon and western Arctic, where conditions are, apart from length of season, not dissimilar to those found in many other parts of Canada, but quite markedly different in the eastern Arctic, where we have an absence of trees and vegetation as we ordinarily know it, but which will probably have a requirement for communities to exist for at least specific intervals of time under quite unusual conditions.

So our priorities, while not absolute, would put economic and sociological development problems of the north and the similar challenges, for the development of native people, at the top of our priorities but we would, having said that, not want to neglect these other considerations that I have touched on here in the conservation area, for example, which have been aptly described, or at least the adverse possibilities there have been aptly described by the former Secretary of the Interior, Udall, in his book, *The Quiet Crisis*. They have that kind of implication, that it happens quietly without your noticing it and therefore when we do strive for our priorities we have to bear these factors in mind.

Senator Belisle: Thank you very much, Mr. MacDonald; I must say that this new information that you have added has assisted me in finding new lights, or giving me a new . . .

The Chairman: The northern lights.

Senator Belisle: That I did not detect in your brief.

For example, in your brief, paragraph 3, you say:

... it will be evident from this report that the Canadian Wildlife Service and the National and Historic Parks Branch have shown a strong research orientation, being the two departmental units with administrative responsibilities in which research played a major role. For this reason, the submissions of the Parks Branch and the Wildlife Service make up the major volume of this brief. At the same time, the research and economic development group and the Northern Science Research Group also conducted substantial amounts of research, primarily in the social sciences, while the Indian Affairs Branch and the Northern Administration Branch conducted little research themselves but arranged for some research to be conducted under contract.

My next question is this: In view of the above statement would it be true to assume that more effort has been deployed to wildlife service and the national historic parks branch than to the economic development of the north and to the scientific and technological problems regarding the resources of the north and the economic development of the north?

I am sorry, and I repeat that in my first reading of your brief I did not readily find out what resources were split, to which ones you referred as being split.

Mr. MacDonald: Senator, I think that this understanding arises naturally from an accident of methodology rather than the weight of the resources which are applied and it is found in rather subtle words when we refer in my opening remarks to the development of specialized research capacities within the department.

The key phrase here is *within the department*, where specialists are in limited supply, so it is an accident really of methodology or circumstances prevailing in or outside the department.

In the Canadian Wildlife Service, for example, we are in fact probably the centre of gravity for scientific research in the area in this country, and indeed I could safely say without bringing too many blushes to their cheeks refer probably within the world they are an outstanding service in this regard.

However, on the other hand our scientific needs in the north have always excited far more attention than is necessarily found exclusively within our department. The National Research Council, the Defence Research Board, the Department of National Defence generally, scholars within universities and so forth, have all devoted a great deal of attention and we have a northern science research group and a northern coordination centre whose primary task was

not to undertake this research and re-invent the wheel on our own application, but to sustain, stimulate and to coordinate wherever possible research among other government departments and agencies within the government of Canada and outside.

We have done this through coordinating committees to ensure that problems did not fall between two stools, equally that we did not waste resources either on our own part or some other part by having two very scarce elements of capability in this area pursuing the same problem. Generally we try in absolute terms to stimulate the greatest quantum of research wherever we can do it. We have done this by coordination and by a program of university grants. We have tended in the northern side to rely more and more on that, because the scholarly interest is there, the facilities were there and we went to them.

Senator Haig: Do you direct research in any way?

Mr. MacDonald: We direct research, for example, in the Canadian Wildlife Service.

The Chairman: But not in the north?

Mr. MacDonald: In the north, Mr. Chairman, we do very little research on our own.

The Chairman: What kind of influence do you have on the programs which are going on outside the department? For instance, so far as the universities are interested in research in the north, do they merely apply and select their own areas of research, or do you try to influence them in looking at what you think are the priorities in that field?

Mr. MacDonald: I will ask Mr. Kerr to answer that.

Mr. A. J. Kerr (Chief, Northern Science Research Group, Department of Indian Affairs and Northern Development): Sir, the program contains in essence two areas of responsibility: One which is for the most part concerned with encouraging research by university people. This program of grants to universities began as a result of a suggestion from the advisory committee on northern development, which is an inter-disciplinary committee composed of the deputy ministers of the appropriate departments, including our own, the Department of Transport and so forth. At that time it was felt that in some measure the development of the north could be expedited if there were a greater supply of scientists with northern experience and northern commitment. It was also decided that perhaps the most effective means of accomplishing this was to allow organizations at universities to determine their own directions.

So in these terms our grants program to universities has been in essence undirected in so far as this department is concerned.

The Chairman: And it is undirected also in so far as research in other departments is concerned, in the sense that they select their own areas of research and you try to avoid duplication?

Mr. MacDonald: That is right, although there are a minority of situations where we have a specific requirement, but the broad philosophy is the one of stimulation and support.

I should also add that, for example, we have established the Inuvik laboratory in which we do nothing ourselves, but it is a host laboratory available to researchers, scholars and institutions with an interest in the north.

Senator Belisle: From the information you have given us regarding universities and the assistance universities are giving to your department, may I be permitted to ask in what manner does your department establish priorities and the kind of funds to be expended. I will go further: I do not think that any member of this committee would be critical if you could expend vastly more funds on research to improve the method, for example, of mineral exploration in the north. What research is being done concerning minerals or oil? They found oil in Alaska; why not in the north?

Mr. MacDonald: I would like to remind you that we put a group together called Panarctic before they found the oil in Alaska and we hope to be in there very quickly ourselves with oil.

To answer your question specifically I would like to remind you of the existence of the Department of Energy, Mines and Resources, which is a great, in effect, scientific institute in all of that area of metallurgy and related geological and earth sciences and we depend on them for the scientific work in that field.

Our responsibilities therefore are to stimulate, and to confine ourselves to direct stimulation of the industrial components to exploration. In other words, it is not within the ambit of what we are talking about here; I just make reference to the fact that we have a very extensive incentive program designed to encourage exploration.

We went to what some people might consider the extreme in the manner I have just indicated by entering into a government-industry consortium in which we have 45% and are directly concerned in searching for oil in the Arctic islands which hold out

the hope of transforming Canada's position as a world oil producer.

Senator McGrand: In the Northwest Territories and the Yukon what is the breakdown in population between Indian, Eskimo and whites; have you got that?

Mr. MacDonald: I do not know if I can give you the numbers, but I will give you the rough approximation. The population of the Yukon is somewhere around 15,000 to 18,000, of which about 15% are native and that is largely Indian. The population of the Northwest Territories will range from between 30,000 and 35,000, of which about 60% would be native, either Indian or Eskimo, predominantly Eskimo. If you divided that and took, say, the eastern Arctic, the population would probably be almost entirely Eskimo.

Senator McGrand: I was not meaning the eastern Arctic; I just meant the Yukon. Some time ago I read a report on the resources of the Yukon made by ARDA and I got the impression that . . .

Mr. MacDonald: Are you sure about ARDA, sir? Would it not likely be a report called the CARR report we just released? ARDA I do not think has ever made a study, although one is never sure about these things.

Senator McGrand: Anyway, regardless of who made it I got the impression that while fur trapping by the Indians and Eskimos was definitely on the decline and on its way out, I have been told by members of your branch that the fur crop is about the same every year and there is no danger of it disappearing. I would like to have you give me some idea of the livelihood of the Indian and the Eskimo from the fur trade?

Mr. MacDonald: I might just make a few remarks in general. I am not sure who we may have here to comment upon anything more specific. Of course, the animal population is subject to cyclical variations for a variety of reasons; it does go down and it does come back up and, of course, in some areas with the progression of different kinds of land utilization the population even cyclically is reduced absolutely over a period of time.

I think the most important point to make is that the other variables, of course, are market conditions and the growth of the population, which must be sustained, the human population, by this activity.

With the native population now growing much more rapidly than it did in the past, indeed, over twice the national average, from a strictly economic

point of view, an economy based upon the renewable resources is not a very strong weapon. That is about what one would say in a generalized sort of way.

That does not mean that it does not remain a very important source of livelihood in various specific areas. We try to do our best in our various programs to support this kind of activity, but from a broad strategic point of view we are looking in the long run to a much greater population which will make much more sophisticated demands on the part of young people.

We see this development resting on the extractive industries and peripheral industries that will grow up around it.

Senator McGrand: On page 32 in paragraph (g) you say:

Ecological research is a slow business because of inherent difficulties.

What do you see in that research as a sort of support for the population of that area and that would include Indian, Eskimo and white? What did you have in mind? I just did not follow it.

Mr. MacDonald: I will ask Dr. Munro to elaborate.

Dr. D.A. Munro (Director, Community Affairs Branch, Department of Indian Affairs and Northern Development): Mr. Chairman, senators, I think that what was said in this paragraph was in the context of Canadian life as a whole and we were thinking of ecological research as a necessary under-pinning to the development of standards of environmental quality, to the maintenance of wildlife populations for recreation and for their own sake.

As the Deputy Minister just said, it would be a poor strategy to pin our hopes for the maintenance and the improvement of standards of living for native peoples on resources such as fur, because of the marketing problems, because of the increasing disinclination of the native peoples to go out on the trap line when facilities and services are becoming available to them in communities.

This particular statement about ecological research was not aimed primarily at the subject you are asking about.

Senator McGrand: On page 57, line 16 you say:

The Northwest Territories government has been concerned for some time about developing the best methods possible for the utilization of the white fox populations.

Now, we are going back to fur again, and the yearly resources that come off the land each year. Is there any possibility that this white fox population or other fur animals could be developed as ranch animals, rather than just simply on the wild? Is there any possibility of that? I understand that is a difficult thing to deal with, because it can travel in a very wide range.

Dr. Munro: The person who undertook this research on the white fox happens to be in this room in a different capacity; he is serving for a term with the Science Advisory Council. Perhaps if it is appropriate he could respond.

The Chairman: Are they trying to develop a new expertise in that field in the science council?

Mr. MacDonald: They are just getting a little foxy there.

The Chairman: Would you care to comment, sir?

Dr. A. H. MacPherson (Regional Supervisor of Research, Canadian Wildlife Service): Mr. Chairman and Senators: The ranching of white fox has been tried in a number of areas, including the Canadian Arctic. It has been found to be uneconomical by the Hudsons Bay Company. It is, however, practised in Poland, Norway and the USSR, where I think the inputs are a lot cheaper.

The Chairman: The same thing does not apply to mink, though.

Senator McGrand: Well, it would be slightly different, I think.

The Chairman: There have been some very interesting experiments, I do not know if they are still going on, in the north, near Aklavik.

Senator McGrand: The mink ranching is done down here; I am thinking of something to be done strictly in the north.

I would like to get some idea of the Mackenzie Delta; I notice in some material I have there are a great many articles written on the Mackenzie Delta.

Now, when you think of a delta you naturally think of soil and I presume a lot of this has been more muskeg than soil. What possibilities for agriculture, or what type of agriculture could be made adaptable to the climate of the Mackenzie Delta and what else does it give us besides there must be a place for muskrats, there must be a place where reindeer and caribou can survive, but what else has it got?

Mr. MacDonald: Certainly, senator, the Delta is an area that has received a lot of attention.

Mr. Kerr: May I rephrase your question, Senator: Your question I think was what does the Delta have in terms of physical resources?

Senator McGrand: What has it got to offer in the north? What does it mean to its economics? How much human population and industry and so on can it support? I was just thinking of is there any chance of agriculture there?

Mr. Kerr: The Department of Agriculture has operated as an outpost from the experimental farm in Fort Simpson for several seasons an experiment to investigate the possibilities particularly of the growth of leaf crops. Root vegetables do not do very well this far north.

The Roman Catholic Mission succeeded in growing quantities of potatoes a bit south at Good Hope for a good many years. The potato possibilities in the Delta are very small; leaf crops such as cabbage seem to do very well.

The Department of Agriculture kept that up for some years. They dropped it basically because of the drop in freight rates and it is now cheaper to import leaf vegetables from the south than it is to grow them locally.

In terms of fur, a considerable number of muskrat, of beaver in some quantity are coming in, although not on the scale that they are available further south in favourable beaver areas. Mink in some quantity; a bit further to the east, on the Anderson River, some marten.

Forest products: You may be aware that the tree line passes through the Delta rather to its northern extremity. In the southern area and areas adjacent immediately to the Mackenzie Delta there are trees which are now being harvested and sawn into boards for local use. It appears at the moment that this locally produced lumber can compete with outside produced lumber.

Senator McGrand: When I looked over a number of articles that are available on the Delta I felt that it must have some particular significance in the economy of the north, there as been so much written on it. That is why I asked.

It would seem to me that the Indian and the Eskimo, especially the Eskimo, in the far north is the logical person to use as a technician, to be developed as technicians for the development of the north. They are born up there; they are probably going to die there. They do not mind living there,

while people who come from the southern part go up there usually for a period of a few years, and they have no intention of leaving their bones up there.

What is being done to develop the Eskimo livelihood in the, as you say, the areas of mining and oil research?

Mr. MacDonald: Mr. Chairman, I would like to reply to that.

This, of course, goes to the heart of our whole problem, the interrelationship that I referred to earlier. I mentioned there were two important reasons for developing the north: One is the economic value of it in its own right; but the other is a sociological implication for the people who are living there.

We certainly take it as a point of departure and it would be a great tragedy that this economic development of the north which we believe to be a fact now should take place without the participation, should they be willing, of the native peoples in the north.

The specific steps we have taken, first of all with the creation of the educational system which, right back in your time Mr. Chairman and before, has been a small miracle in its own right.

The Chairman: And health.

Mr. MacDonald: And health, but as regards a transition to a different type of life, of course, the educational system has been the starter.

Next has been the area of special skills; we have a vast and interesting vocational skills training school at Churchill where they are trained; another heavy equipment training plant at Fort Smith. We take it further in terms of specific agreement with industry when we grant resource assistance. We are exacting commitments for the employment of people, I quote the Anvil agreement as an example, where we have provided for up to 25%, I think it is, under successive stages of the employment force being made up of native northerners providing we can supply them with the requisite skills.

More recently I met personally with representative of the petroleum industry in Calgary because we felt we had reached the point where we could say to them this is not a dicey game any more; the oil industry for the north is almost an established thing. We think we have the right to ask you to do some intensive planning, to make some commitments, because we do not think the Parliament and the people of Canada would accept a development which the native people did not participate in. Even on

unskilled matters, to bring up crews from southern Canada, which while the traditional practice elsewhere is not appropriate in these circumstances and, of course, we think that it would be a tragedy if when things really get booming we find say two, three, four years hence, they are not being employed and the answer is they have not got the training. Now is the time, therefore, to give them the training. So this is the message we are putting to them. It was very well received and we have got specific machinery working now supplying them with the names and the qualifications, educational skills and so on that they may have.

Again more specifically in Panarctic; we are starting our first three wells this year, the first one next month. Last fall five or six Eskimo young people, mature men really, were taken down to the petroleum school in Edmonton and given the skills training, then employed in southern Alberta on established industry training and will be working on the Panarctic project this summer.

The Commonwealth Drilling also have informed me that they hope to have about another 20 employed on less skilled and non-skilled occupations. The rest of the industry have undertaken to try to follow this pattern, bringing people down, giving them the training and making specific arrangements for their employment.

That off the top of my head, senators, is what we are trying to do and the general attitude.

Senator Bourget: Have you got any technical schools up there to train those people?

Mr. MacDonald: We have the school at Churchill and one for heavy equipment handling at Fort Smith. I should also just add that the Pine Point railway is almost entirely operated by Eskimos.

Senator McGrand: Sixty per cent of the Northwest Territories is Eskimo, or mostly Eskimo. There is evidently some opportunity for them to learn these skills and get employment. I was under the impression that it had not been too successful, that not too many have been employed so far. What is the livelihood of those 60% of the population? What is their chief source of livelihood in the western Northwest Territories?

Mr. MacDonald: May I comment on your impression and then offer an assessment: There are two difficulties that have to be overcome to achieve complete success in what was established as the target of full participation, if they are willing, in this development. Mind you, not every Eskimo

necessarily wants to be a miner or an oil driller; we just cannot presume in this respect.

The two factors are, of course, the progress of the educational system, which has been a fairly recent project, so the numbers of people with the requisite preliminary minimum education upon which certain other skills could be founded is still a small source. It is streaming out now; I do not know if there is anybody here who can give the educational statistics, but I can just state it to be a fact that it is a relatively young educational system.

The other major point to bear in mind is that the majority of the mineralized developments have taken place in the western Arctic and the population is in the eastern Arctic. This is the unfortunate dichotomy that prevails and it is for this reason that we are advancing certain other interesting projects which we would like to see started if the markets of the world favour them, such as the huge iron ore development at Mary River in Baffin Island. There we have 100 million tons proven reserve of 68% grade. The main limiting factor at the moment is the shipping season of possibly two or three months and the weakness of world markets for iron ore.

That is what we need to improve the employment opportunity, or a far more difficult decision of migration of people.

Senator McGrand: I read somewhere that the suicide rate among Canadians is about 7.2 for a hundred thousand and among the Eskimos it is about 19 per hundred thousand, which is nearly three times the average of the average Canadian.

Now, this brings up something, the change of their environment and so on.

Mr. MacDonald: Well, I do not know how comparable this figure is or even if it is in fact an accurate figure, with other peoples in the process of transition, but I think we would all probably say to ourselves that if we found a higher than average figure we would not be surprised when we thought of people undergoing the strains and stresses that they are under in the terribly traumatic cultural change that they are involved in.

Men have reached maturity with a great deal of pride because of skills as a hunter; they are eminent in their community and so on. We find this by the way in the technological change in Canada; when you are 40 or 50 and something that has made you good is no longer in demand you find yourself either a welfare recipient or at best a doer of unskilled labour and so on. So this experience is a devastating one for the people.

All sorts of changes are involved when the people are in transformation. The Indian people have suffered this over a longer period of time, probably even more acutely.

We are pressing the northern economic development so rapidly, so intensely, not so much because Canada necessarily needs its accretion of economic wealth right now, but for the very point you have raised, Senator, that it is critical for people who are living today.

Senator McGrand: Why I asked that question was because I was under the impression that the Eskimo welcomed this change of environment; he saw a better future.

Mr. MacDonald: I think the fact he in a sense welcomes it is evidenced by easier adaptability, if there is something to adapt to. The problem comes when there is nothing to adapt to. Regrettably these things do not march in nice consonance.

The traditional way of life is disappearing, or else the pull of an established community on the family, dependents and young people take them away from the other before we have prepared for that.

For example, if we could have waved a magic wand brought the Baffin Island iron ore into production three or four years ago it would have been the best thing in the world we could have done, but we have no control over the iron market of the world and it unfortunately happens to be the fact that the markets have fallen in the last two years and look like they will be down for another year or two.

We are still fighting the technological transportation problem of lengthening the shipping season; we are supporting the Alexbow; we are looking forward to helping oil companies on this huge tanker trial this summer. That is an instance of how a major economic development like the finding of oil can bring the economic drive behind research which will have benefits far beyond that which the people doing that research have in mind. In other words, it will benefit the oil industry but if that succeeds, if we have nearly a year round sea passage in the north, the economy in the north is transformed overnight and we will really make a leap forward.

While still the tragedy will remain that many people will not be recovered because it is sometimes too long, we hope to prevent more of it happening.

The Chairman: Do you sponsor a lot of research in this strategic field of transportation?

Mr. MacDonald: Yes.

The Chairman: Because this is, as you say, the big problem in the north.

Mr. MacDonald: For example, the Alexbow device was going unattended and we through our membership in Panarctic arranged that Panarctic picked up 51% of that from the company and have used it on a barge in experiments last year. We are working with the Department of Transport now for tank-testing, model tests, leading to fittings on probably two small but comparable ice-breakers, because we need objective evaluation in like circumstances of the performance with and without.

Likewise we have been rendering all assistance asked with respect to the Manhattan tanker that is coming through this summer. We are working very closely, providing such things as ice data from the various government departments. The Department of Transport will lend ice-breaker assistance and so on, because we have great interest in it.

We have had transportation studies on the Yukon, but right now there is no doubt about it that the transportation, ice free, or nearly ice free, or ice impervious transportation in the north is the key to it.

If that fails, then one is looking a little further ahead to air transportation and the huge capacities that are possible here with energy sources such as gas to reduce the weight and then taking it out and, of course, we are still looking at railroads as a probable economic means of transportation.

The Chairman: What about underwater transportation?

Mr. MacDonald: We looked at this very carefully when we went into Panarctic and before.

The whole argument used to be why bother looking for oil if you cannot get it out and we used to say this is one of the chicken and egg arguments; some people say do not look for it, because you cannot get it out; others say, if we get enough oil in vast quantities there will be a way found to get it out and that is being proved right now. This Manhattan project alone has taken \$15 millions in the way of expenditure, to show you the scale of expenditures that are involved.

We looked in that period of time at under-sea tankers. We talked about it as well with some French

interests; Petrolpar, for example, were very active in exploration and had the same interest as we had; Japanese shipyards and the French nuclear research were addressing themselves to this problem. I think our present indication is that this is not now a promising outlook because the problems of by-oynancy and commercial load seem to contradict each other.

We have had hydrography done on it, however, in anticipation and we have had hydrography done on underwater pipelines as well, so there is a fairly wide spread matrix of interrelated research going on either supported by us or which we are aware of and getting feedback on.

The Chairman: But do you feel that our research program in that field is sufficient at the moment?

Mr. MacDonald: You could argue in a sense that it is not; you might argue, for example, why had we not three years ago spent \$15 million to do what Atlantic Richfield are doing.

The question is in the order of priorities of the government, having to cut the pie, having sociological needs to meet and welfare and many other things, could we have successfully sold either ourselves, or the government, or the society that that was a sensible thing to do when there was no real evidence of need for it, but the moment you have a proven, or nearly proven potential like Prudhoe Bay, with reserves calculated at anywhere from 10 to 40 billion with a probability at the latter end of the scale, equal to all the reserves of the North American continent at that moment of time. There is a very high profit per barrel ratio because we have nearly middle east prices due to the oil being found in the huge pools characteristic of that area on one end and the high posted protected market of the continental United States on the other end. With this you have an enormous economic incentive against which \$15 million is nothing.

So there is always more that we could do; it is a question of when and how.

Senator Hays: I would like to ask Mr. MacDonald a few questions; I would first like to make a point. In Alberta, where I suppose oil has had a great deal to do with a better way of life as far as Alberta is concerned and the government have received in royalties anywhere from 35 to 50% of their total revenues.

In the Northwest Territories this land all belongs to the Crown?

Mr. MacDonald: In the right of Canada, federally.

Senator Hays: This is in the right of Canada, so they receive it. In your conservation of these natural resources do you take a royalty?

Mr. MacDonald: Yes.

Senator Hays: What is it, a 12½% royalty?

Mr. MacDonald: I think it is 10% but, of course, the issue has not really arisen yet, Senator.

Senator Hays: But these are the ground rules.

Mr. MacDonald: Yes; there is a bill before the Senate now on oil and gas conservation and we can establish the royalty basis system.

Senator Hays: What is the total amount of money that we are spending in the Northwest Territories now?

Mr. MacDonald: I think we are running on the order of, I am not sure whether it is for the Yukon and the Northwest Territories, between \$50 million and \$60 million. That is our department alone.

Senator Hays: So if this oil is economic and we do not produce any oil that will compare with offshore oil today . . .

Mr. MacDonald: Yes, it is an entirely new ball game.

Senator Hays: If this were possible, then I would suppose we would have no problem with markets in so far as the United States are concerned.

Mr. MacDonald: I am not sure.

Senator Hays: If we can compete dollarwise, if it is not just for strategic purposes and that sort of thing.

Mr. MacDonald: It is hard to forecast what our market position will be in respect to the United States, but I think one thing is clear and one of the reasons we went into Panarctic was that we were told long before Prudhoe Bay that on the geological evidence if we found oil it was the most likely area on the North American continent to find it in the large pools which are characteristic of the middle east. Therefore that is high volume, low cost oil and therefore we do not have to have the American market; we can sell that oil anywhere in the world.

Senator Hays: Yes, because you will have a world market.

Mr. MacDonald: Yes, we have a world market; that is why we are in a different ball game altogether.

Senator Hays: Is this why you say then that mainly what you want to do is to get it to the sea?

Mr. MacDonald: We would get it into the United States market for as much as we could and that would pay for a pipeline, for example, down the Mackenzie Delta; we are working as actively as we can on this as a second line alternative for it.

The future, and there are attractions we hope to be able to point out to that, because the Mackenzie Delta is going to probably be the other important source of Canadian oil, but we want two or three strings to our bow, because we may find oil in truly vast quantities in the Arctic islands.

I would like to point out that the Arctic islands alone have a volume of sedimentary deposits, which is not oil but is where you find the oil, equal to the three prairie provinces combined. In addition to that, in the Mackenzie Delta you have an extension of the same formation that holds the Prudhoe Bay discovery.

Senator Hays: Geology tells you that this might be; you are not sure of these proven resources.

Mr. MacDonald: The only way you can be sure is if you drill it and find it.

Senator Hays: Because even in the Alaskan fields the off-centre wells just do not indicate that maybe there is as much there as they had anticipated at this particular spot.

Mr. MacDonald: That is not our information at the moment.

Senator Hays: Well, maybe my information is not as good as yours.

Mr. MacDonald: I would not put any money either way. All I know is that the people we have been talking to and, as you know, I am a member of the task force . . .

The Chairman: Perhaps this is the difference between you, Mr. MacDonald and Senator Hays; perhaps he was willing to put some money down.

Mr. MacDonald: No, the difference is that Senator Hays has the money and I do not.

Senator Hays: Your friends were in the high Arctic and mine was a tool pusher.

Mr. MacDonald: All I can say is that I have seen no lessening of the optimism or the absent terrible sense of urgency that the companies are displaying to commit themselves to the pipeline, to do these various things, because they want to get that oil out. They believe the oil is there.

Their plans seem extraordinarily firm for 1971; they are fighting to get at 1971 rather than 1972, but I must say and everybody has noted it certainly this is the most remarkably optimistic forecast based on what at that point of time was only two wells.

Senator Hays: In the field of research, as you said, \$15 million is not a great deal if you make the right sort of discovery.

Why would it not be sensible for the government today in the field of research, instead of having a 10% royalty set aside a small amount for research, because it is a vast area. Maybe we have more in the resources there than any other unknown spot in the world.

Would you suggest that maybe this would be good thinking in so far as this particular committee is concerned? Because \$40 million or \$50 million, when you think Alberta received I think last year something like \$150 million from natural resources.

Mr. MacDonald: Our royalty revenue is minimal right now.

Senator Hays: But the potential.

Mr. MacDonald: The potential of the future will be very great when we find the oil and it begins to flow to market, but there are no in a sense disposable funds right now. I think it would be six of one and half dozen of the other, whether the government specifically earmarked royalty revenues or simply recognized that this was an enormously great return and were prepared to put the money in as an investment.

I will say that in fact the government of Canada has so recognized and has been putting a lot of money in. We know we are putting \$9 million in Panarctic. We put in \$10 million this year on major roads, all of which in their own way are speculative investments, to open up areas which we have reason to believe can prove profitable and rewarding for expansion.

There are a number of other matters which are on the cooker, so to speak, which involve that kind of deliberate investment against a reasonable expectation of return in the future, strictly on an economic analysis.

Senator Hays: I understand that this new pipeline for the Alaskan oil to the sea will cost in the neighbourhood of almost a billion dollars.

Mr. MacDonald: Right.

Senator Hays: If Canada were to have an oil pipeline; this one they are putting on top of the ground, are they not, it is a 48 inch line?

Mr. MacDonald: It is a 48 inch line; the problems there are going through permafrost. They range from arguments about whether they will cool the oil, because otherwise it will melt the permafrost and make it unstable.

Some other ideas have been for just laying a gravel road and putting the pipeline on top of it with a suitable structure over it.

Senator Hays: What sort of research are you thinking about in moving oil? It is pretty gooey stuff when it is 75 below zero running through that pipe on top of the ground.

Mr. MacDonald: It all depends on what oil you pipe. It is variable, according to what kind of oil it is, and these kind of problems. It will affect the flow. For example, that 48 inch pipeline in that country will probably carry closer to a million barrels a day rather than the two millions for which it is theoretically designed, because of these factors.

Senator Hays: You mentioned in your opening statement, or somewhere along the line, that transportation is where most if it is involved. If you solve this, the economics as far as the social problems, a lot of these will be resolved, or greatly helped?

Mr. MacDonald: Not resolved, but greatly assisted.

Mr. Hays: You think then that in the field of research the amount of money you are spending is sufficient?

Mr. MacDonald: No, I think the honest answer is that there are very few areas where you could not say honestly that you could spend more money and if we had a greater budget I think we would allocate more in the area of research.

Senator Hays: Where would you spend this money? What priority, what do you feel is most important?

Mr. MacDonald: I think it would be on the technological side at this stage, primarily in the area of transportation.

The Chairman: Would it be land transportation or sea transportation?

Mr. MacDonald: I will know better next June, after the trials of the Manhattan, whether we are whipping a dead horse, because this will materially affect the kind of transportation outlook we will have in the future.

I will tell you what the Manhattan represents and I will go back and tell you what the alexbow represents in case the members are not familiar with them.

The Alexbow is a sort of an ice plough invented by a chap called Scott Alexander who had been in the Air Force and had been up north a great deal and got this idea. It differs from the traditional way in that an ice breaker runs over the ice and crashes down and crushes it, then backs up and goes

over and down like that, whereas the plough is designed to run under it and by a rather interesting form just break it with seemingly great ease. Small scale trials which were run in the Great Lakes and of which I have seen films show remarkable performance, but we are all familiar with what the difference between scales can often make, sometimes an absolute difference. So we are inclined to scale up to find out what it will do.

Senator Belisle: Does it have the same ease at ten feet thick?

Mr. MacDonald: Theoretically it does. The theoretical possibilities are that it will just go on cutting through ice with the requisite amount of energy. It has no side pressures because it throws it away, unlike the ice breaker. It requires little reinforcement on the sides, again in theory.

Senator Robichaud: But is there not a tendency for thin ice to break, while the heavier the ice or the thicker the ice then the harder it is to break it?

Mr. MacDonald: That is where you come to the question of scale, but on the other hand salt water ice is easier to break than fresh water ice. The other thing is what do you do with 200 feet of ice? There has been some concern that this plough coming along and running into one of these things goes right down instead of going straight on. On the other hand, the point is made that we are talking about one year ice and that these ice islands of 200 feet or so and these ridges are something that are plotted by satellite observation, which we do now, anyway, and they are just like islands, you navigate around them. So the debate goes back and forward; we are pursuing it and these are the things that have to be found out, but that is what the Alexbow is and that is what it represents.

Now, emerging is another school of thought which simply says look if you take one of these very large vessels of a hundred thousand or more tons with a little bit of reinforcing here and there, whatever might seem to be appropriate, and the appropriate amount of power, the sheer inertial force will just go through ice like paper, even 50 feet of ice.

This is some of the argumentation on it and that is why people are spending something like \$15 million on this tanker next summer, because they now have an economic objective. A pipeline through Alaska is fine, a pipeline down the Mackenzie is fine, but there is nothing that can beat tanker shipment for flexibility and cost.

So that is where we are now and if this works then you can see that instead of facing a painful land

transportation barrier between some of these peripheral and barrenly located resources that we have and our potential markets, we have some of them practically on tide water.

This is certainly true of our oil in the Arctic islands.

Senator Hays: You said it is right on tide water?

Mr. MacDonald: Some of it would be; we have developments, the Baffin Island iron as you know is only 60 miles from tide water; Coppermine likewise and so on, and as we go on exploring further on.

Senator Hays: So what you are saying is that this oil is cheaper to take to sea and bring it around to Vancouver to pipeline, or to Montreal?

Mr. MacDonald: There is no question about this; on the economics of tankers you cannot touch it.

Senator Hays: Do you have any cost for transporting oil from Alaska to Vancouver by tanker and pipeline?

Mr. MacDonald: I did have them; my mind is a blank, senator. We went over this just before I went away a couple of weeks ago. We had presentations by various companies when we were looking at what hope we might have to dissuade the entities involved. We were talking to Atlantic Richfield and Humble, who are connected with Standard and Imperial here, re the Alaska pipeline and about a possible preference for a Mackenzie pipeline. In that exercise we were looking at all of the numbers involved. All I can say at the moment is that the tanker costs are just incomparably cheaper, because pipelines are expensive to build; they have a lot of other virtues, but they are very expensive.

The Chairman: Especially there.

Mr. MacDonald: Yes.

Senator Grosart: Mr. Chairman, if I may descend from these lofty flights down to mere science policy, I would like to suggest to Mr. MacDonald that our task for the moment is a national science policy, which seems to have developed, if that is not too flattering a word in a science committee, as a series of ad hoc and departmental decisions over the years.

One of the consequences seems to be a fragmentation of responsibility for science policy, particularly between departments.

There seems to be on the surface, at least, an example of this in the brief. Perhaps Mr. MacDonald

can ease my mind and my concern; I am referring to the appendix, page 1; in the first paragraph there is a statement that the water resources branch and the resources development branch of the department were transferred to the Department of Energy, Mines and Resources.

Then on page 11 of the same appendix in the last paragraph I read that the assistant director is responsible for major resource development and management will be involved with major resources in the Canadian north, including mining, oil, gas, water, etc. Now, it seems to me there has been a transfer of exactly the same responsibilities that now will be undertaken to another department; is that it?

Mr. MacDonald: No, sir. The distinction is to be found in the distinction between research and study and management of a resource. The function we perform with respect to water in the north is the function that a provincial government would perform, that is licensing, decisions with respect to utilization. We rely on the water resources branch of the Department of Energy, Mines and Resources for the scientific support and the studies, water gauging, the stream flow measurement, all of these other functions. There is no duplication whatsoever; our person looks to them.

We buy from the Department of Energy, Mines and Resources just like a province does at a pro-rata cost for the placing of water gauging stations in the north, so that we can have our position in the total national priorities. It is done by the water resources branch.

Senator Grosart: Yes, but your reference in the transfer is not merely to water, that is one thing, and the resources development branch.

Now, this would seem to be the whole field of resource development.

Mr. MacDonald: The difference again, Senator, is that the resource development branch, which we had just created prior to this re-organization, had reference to a posture for the federal government as a whole with respect to resources in Canada administered by provinces and to be a focus for the policy formulation of the government as a whole as to the position it would take with regards to a variety of things, like roads to resources, other cost sharing programs, and so on.

It was simply a statement of the fact that although the resources are in the jurisdiction of the provincial governments in Canada, resources and economic development are inseparable in Canada, and because the federal government has a clear responsibility for

economic development, the federal government could not afford not to have a position with respect to resource development, and this is what that branch was doing.

Now, that has moved to the designated resource department, called the Department of Energy, Mines and Resources, which is the federal department of Resources. It has relationships with provincial governments; it has relationships with us. Our role with respect to the territories is that we stand in lieu of a province; we have the jurisdiction over the actual management of the resources.

The Department of Energy, Mines and Resources does not manage any resources; it is a policy department that forms the policy.

The Chairman: Mainly a research department?

Mr. MacDonald: Research and policy.

The Chairman: Very broad policy.

Mr. MacDonald: Water research, energy, trans-Canada grid lines and all those things which can come under the heading of the desirability and importance of developing resources in this country and what the federal government might or might not do alone or in conjunction with a province or in some cases with us.

The Chairman: At best they can only, I suppose, in terms of policy, indicate targets, because they have no constitutional responsibility.

Mr. MacDonald: That is right; whatever they do and when we had that responsibility, whatever we did was through the process of agreements with provinces. We simply agreed, either through the council of resource ministers or bilaterally, it may have been regionally like the tidal study in the Atlantic provinces, that this was a desirable objective and to secure the consent of the government when Parliament and money were involved and go ahead and do it.

Senator Grosart: It seems to me to be not merely a departmental fragmentation, but a fragmentation of the federal government itself, which to me does not make sense.

Mr. MacDonald: Did I make myself clear, Senator, about the fact that you must recall that we stand in lieu or in place of provinces? North of 60 there are no provinces, so because of that this is a special circumstance. The reason it was set in a special department, in the department of northern development, as opposed, for example, to putting it into the Department of Energy, Mines and Resources, was

because the constitutional and political development and the resource and economic development are held to be inseparable; they are all of a part and the people there would not want it melded into one large pot dealing with all other things. That is the answer; that is the rationale.

Senator Grosart: I will not argue the theory. I am concerned with this: If as has been suggested our total funding of R & D in Canada might move in the near future from say 1.3% of GNP to 2% of GNP, this means that there is going to be a billion dollars we hope available for research and development.

If this type of fragmentation continues, where can the people of the north or the people of Canada who are interested in the north expect to find the advocate for an adequate part of that being spent in the north?

Mr. MacDonald: That I think, Senator, is to me at least obviously the reason why one has a Department of Northern Development. If you did not have it there would not be this focus; this is the argument I think against placing it in the Department of Energy, Mines and Resources, because it would not be singular.

In other words, the north, because there are not provinces and at the moment as far as we can see no foreseeable likelihood of there being provinces, because of the absence of a population, there must be within the structure of the federal government just this type of advocacy which you refer to and this is what we regard ourselves as doing.

We have the northern science research group and the coordination centre; our task is not necessarily to do this research ourselves and we do very little of it, but to try to see that it is done either in the universities or in the Department of Energy, Mines and Resources.

I gave you an example: We found that with respect to water gauging, which is a very important element of research for the whole resources basis of the future, because stream flow measurements that are less than 25 or 40 years are really very little use to you because you have got to get a mean average on these things that means something. Obviously these things have been done in the southerly regions a lot sooner, because they are closer to the development.

We found that by the fact that this was financed entirely in the Department of Energy, Mines and Resources and they had to cut their cloth budgetarily the tendency was to cut back that which was financed entirely on the part of the federal government and not that part which was financed jointly with the provinces.

So we recognized this and we, two years ago or so, entered into an arrangement with them whereby we

would pay 50%, just like a province does, so that we get the same type of priority and we advocate with them just like a province the importance of doing this kind of long-range research in the north, so we do consider ourselves an advocate; that is what we would think we are in business for.

Senator Grosart: What is the function of your advisory committee as referred to on page 8 of your brief?

Mr. MacDonald: The advisory committee on northern development?

Senator Grosart: Yes?

Mr. MacDonald: That is coordinative and also formulates policy recommendations for the government involving matters going beyond the jurisdiction of our department. Obviously there are other departments that have heavy responsibility; the Department of Transport is an obvious case, both in terms of airfields, aids to navigation and the sea transportation.

The Chairman: Defence.

Mr. MacDonald: And Defence, of course. So classes of subject matter fall either under the need to coordinate so that the left hand and the right hand do know what they are doing; to achieve some commonality with respect to housing and other matters that we have; to avoid redundancy by having a common service department frequently instead of having several; when we have an isolated area the logistics of support are very difficult; finally, to consider such major issues as, for example, we considered recently this question of the United States oil companies' desire to run the Manhattan tanker test in these waters this year. We had to consider what advice we could tender the government as to what attitude the government of Canada should take towards it, having in mind Canada's sovereignty and need to protect its sovereignty in these areas, our interest in the results of the research, and so on, our own capacity to do it.

Senator Grosart: Energy, Mines and Resources are represented on that committee.

Mr. MacDonald: Yes.

Senator Grosart: Do I understand the situation to be that this committee might come up with a science policy decision affecting the north and that you would then have to go to Energy, Mines and Resources for implementation of that policy?

Mr. MacDonald: That could be, yes. I would like to say on the subject of science and research generally that there are a lot of people who do research and there are a lot of people who are customers, consumers. We are a consumer, and our interest is not to do these things necessarily, only in the case of, for example, the wildlife service, where there is in fact very little elsewhere.

The Chairman: And where you have a definite policy responsibility.

Mr. MacDonald: Yes, but for example, the Department of Energy, Mines and Resources is in fact a very large institute of science. It has got the geological survey, the metal and metallurgical research is world renowned and there is simply no point in re-inventing the wheel because we have an interest in the oil, for example, and in geology. The Arctic islands geology, for example, was pioneered by the scientists of the former Department of Mines and Technical Surveys; we simply consumed the product.

The Chairman: I understand also that with regard to research problems related to permafrost this was done in the National Research Council.

Mr. MacDonald: We go to the building research people and we have encouraged them and worked with them for years; we are quite happy to have them. A, C & D has a sub-committee on construction in the north, and that has been headed from time to time by the director of building research in the National Research Council.

The Chairman: Has there ever been any progress, because this research program has been going on for at least 15 years?

Mr. MacDonald: Oh, yes; I would say progress in the sense now, Senator, that building in permafrost is not considered to represent any real problem any more; we know what to do.

Now, you do get a new thing coming along such as this pipeline which presents some rather different challenges and the whole background is now being brought to bear on this.

Imperial Oil on their own have been running a small diameter pipeline experimentally in the north and it tells you some things, but this is being applied and absorbed by the National Research Council right now and the output fed out to again a great number of consumers.

We can talk of fragmentation, but Atlantic Richfield are a consumer; we are interested. We are interested because it helps inform government policy.

When we take an attitude with the United States government or with the American or Canadian oil companies we do not want to be advocating the importance of something unless we know ourselves whether that something is feasible. So that is our interest in it; we are not going to build a pipeline, but we wanted to know the feasibility of various alternative ways of doing things.

Senator Grosart: Mr. MacDonald, that was my point; I am not talking about who does research and development, I am talking about who has the responsibility for making the policy and obtaining the funding for it. That is the point I am making.

I am wondering if Northern Affairs have, as it is presently constructed, this transfer of policy making responsibility, if you have the tools, the structural tools to make policy and to make it stick?

The Chairman: With regard to other research agencies in the government; is that what you mean?

Senator Grosart: No, I am speaking of making policy; policy, science policy, which is a very different thing from science projects or inhouse or outhouse research. I am concerned with the policy.

Have we enough science policy in our whole northern look in this country and, if we have, who gets the credit; if we have not, whom should we blame?

Mr. MacDonald: I think in all of these matters there are some people who are customers and others who are principals. If we were to feel that we were not getting a service from a department we have at least two avenues of recourse. If we could not thrash it out in the A,C & D, if that were the forum chosen for discussion between either myself and the deputy ministers, then we might want to raise it to Cabinet, because in the long run Cabinet will resolve any inter-departmental and inter-jurisdictional disputes within the government.

If we feel that their other claims on their resources are quite reasonable and that to meet what we have in mind is a distortion and an unnecessary distortion, we with or without their agreement would decide to secure it elsewhere. There are many other ways of doing it and there are instances of that over the past.

I might say that we have not found it a difficult problem; we have found that the supporting departments have been extraordinarily cooperative. These things that we are talking about are often so self-evident that the ability to secure agreement on them has not that I can recall from my personal experience been very difficult, and I have been in quite a number of them. I cannot recall a dispute.

The Chairman: So that to come back to Senator Grosart's question, you would feel then that you are responsible for the defining of science policy or research policy?

Mr. MacDonald: Our needs.

The Chairman: Of course, this is policy and then it is carried out, of course, by other people or other government agencies or even outside the government?

Mr. MacDonald: Our job is to get certain things done.

The Chairman: And if there is not enough research being done in certain areas of the north you are to blame?

Mr. MacDonald: Absolutely; if we had not protested it; if we had not tried to do something about it, then it is our fault for not having indicated the need.

Senator Grosart: Do I take it from that that you are satisfied that your science policy requirements in the north are currently being satisfied?

Mr. MacDonald: Subject only to some unforeseen event which will reveal in retrospect that we ought to be doing something. That kind of hazard is around us all the time and subject to our appreciation of the fact that there are something called national priorities and that while we believe that the north ought to be extraordinarily important—I tried to indicate 38% of the land mass of Canada and maybe greater than that proportion of the future wealth of Canada, and that has moved now beyond the point of being a matter of faith, to the point of demonstrable fact; even though we believe in that we also recognize that there are other problems in Canada and that resources have to be allocated, that the total resources to the government itself are limited by public attitudes, tax rates and physical problems. Subject to that, senator, we are satisfied that we have always had cooperation.

I might say that the north has, fortunately I suppose for us, fascinated scientists and certainly in the last decade or so it has received a great deal of the interest of the geological survey in a variety of forms on the oil and metallurgical side, and I am not aware of anything that we feel deeply has been neglected.

Senator Grosart: That is very reassuring. Do you have a contemporary inventory of your science policy needs?

Mr. MacDonald: For the department as a whole?

Senator Grosart: For the north?

Mr. MacDonald: The inventory, strangely enough, is almost entirely in those words: Inventory. That is what is required in the north and that is fairly well advanced in the western Arctic; the emphasis has to increase in the eastern Arctic. It is again a matter of priority and people, the availability of scientists.

We have had a pretty adequate inventorying of the oil potential and we are now reinforcing that in the next successive stage, which is the Panarctic type of thing when you move from the establishment of the general geological formations to much more precise measurements through seismic studies of the sub-formations. We I think would obviously subscribe to the general statement that any acceleration of the inventorying of the mineral wealth north of 60 would be in the interest of Canada, because only when that is inventoried do we then enable the private capital to come closer to their decisions as to what might be more profitable or reasonably attractive to pursue.

Senator Grosart: Again I am talking not so much about a physical inventory, but a science policy inventory.

I put it to you this way, that we are sometimes told that we are lagging away behind the Russians in our science policy approach to the development of the north.

Have you the kind of science policy inventory for the Canadian north that you can contrast with the Russian science policy for their north and say, here is where we are ahead of them, here is where we are behind?

Mr. MacDonald: Yes, that kind of assessment; I cannot recite it to you, I can discuss it.

We are fully aware of the alleged advances of the Russians as against what we have accomplished with respect to the Canadian north. I use the word "alleged" deliberately, because there is a great deal of misunderstanding arising from the fact that we are comparing things which are largely unlike. The tree-line scatter is different in Russia; the transportation in terms of rivers is different in Russia. Finally, of course, their political economic system within which they operated for so long is radically different; and, of course, the population pressures that they had were different, and how they got population migration was radically different from what is present in a free society.

All of this leads us to the conclusion that while you can see certain specific material things in situ in Russia that you do not see in the Canadian north and you might well say that with cities of a population of 600,000 they are far ahead of us, the cases simply do not equate.

We are satisfied that when our north is developed it will be developed on a sounder economic basis, because everything we do is subject to the disciplines of the world market, whereas the Russians ran on a closed economy basis for a long time.

They are now backing away from that; they are now overlooking what we are doing and I say the Russian traffic has been very heavy the last several years. They are extraordinarily interested in seeing what we are doing in the way of mining, how we go into cost benefit analysis when we determine what we do.

Senator Bourget: Is there an exchange of information with Russia?

Mr. MacDonald: Yes, of varying kinds.

Senator Bourget: You have no trouble there?

Mr. MacDonald: We translate a lot of their published material; we have a lot of exchanges of visits. A lot of these visits are very hard negotiating, because there is a lot of quid pro quoing in these things as to who says what, where, and so on.

Senator Grosart: Take one specific example, the suggested Mackenzie route. After the Prudhoe Bay discovery there was some discussion for a while as to which way the oil would flow, out through Alaska or down the Mackenzie. The decision of the entrepreneurs at Prudhoe Bay was quite sudden; they must have done a great deal of research far prior to the discovery to be able to make the decision as quickly as they did.

Were we in a position to come up with the answers from research to put an input into that decision of the advantages of the Mackenzie route?

Mr. MacDonald: Yes.

Senator Grosart: How hard did you fight that battle?

Mr. MacDonald: We fought quite hard, quite hard. I want to be careful what I say now; I want to tell you as much as I can without getting into subjects that are fairly confidential.

Let me simply say that the economics of the Alaskan route were so overwhelming that one discredits one's credibility if you press too hard against something that is so manifestly economical.

The pipeline over Alaska, while admittedly in some very difficult terrain, was nothing that engineering today cannot cope with and that was fairly easily

seen. There is less permafrost to go through than going through on the bias, which is involved in going through Canada. Permafrost was probably more in people's minds than anything else.

Basically, however, it is a shorter pipeline to go over to Valdez or somewhere like that than to go all the way down the big continent. As soon as you get over to Valdez you are transporting in tankers and you can go round right to the east coast if you want to and still be economical. You do not have to wait for the Seattle to Chicago pipeline, which is another possibility some day if we do not succeed in coming down the Mackenzie. That is where the real battle will be; the battle is still to come, or battle is not the right word, I should not say it that way; the discussions, the negotiations, the commonality of interest has got to be settled around the second pipeline.

There was no argument really about the first pipeline; it was the quickest, it was the cheapest and when we looked at it we thought in terms of trying to keep it down as small as possible, let us say enough to meet District 5 which is the west-coast market and therefore continue to protect the mid-west market, which is the one which is of great concern to Alberta and any other futures we might have.

But here again the economics were overwhelming; the difference in that kind of thing between 36 and 48 is about \$28 million; peanuts on a project of this kind.

Senator Grosart: In other words, you had all the facts that you knew they were against you.

Mr. MacDonald: We had all the facts, the technical study that Trans-Mountain had done; we probably know more about permafrost than they did, and so on.

Senator Grosart: I was interested in your comment about the entrepreneurs; I think the phrase you used was a terrible sense of urgency. I think we would all like to think there was the same terrible sense of urgency on our side. I am not saying there is not, but we would like to believe there is in this area of science policy development in the north.

The Chairman: Would it be true to say that in so far as the research which is done in the north related to let us say physical sciences, resources and all this, that in that case you rely mainly on government agencies?

Mr. MacDonald: Right.

The Chairman: When it comes to research in the field of the social sciences, then you rely mainly on universities?

Mr. MacDonald: Right.

The Chairman: I have another specific question, still related to this: I was told that a lot of people refused to move from Aklavik to Inuvik.

Has there been any study of the attitudes and the behaviour of people in that area, why they refused and all this?

Mr. MacDonald: We have a number of studies; I am not certain whether we have had a study on Aklavik. I think we got the message pretty clearly as to why they did not move; they indicated it. We are going to face another one of these problems probably in Fort Rae, where there is a very deep division in the community between the older generation and the younger generation as to whether they should move out of Fort Rae, which simply will not sustain any further growth.

This was the problem in Aklavik and it is an insoluble problem; the place was nearly sinking. It was sinking and stinking, I should probably say.

The Chairman: I was there, I know.

Mr. MacDonald: Looking to what is going to happen in the future, you simply could not count on any further development, so the town of Inuvik was created some little distance from there where the terrain held out the possibility of physical support of a community of the size one might look for for the future.

When that was done, and notwithstanding I think some fairly generous compensation arrangements; I say that because I used to be in the Treasury Board then, criticizing this move from the other side . . .

The Chairman: When we were on the other side.

Senator Grosart: Have you got a friend in Energy, Mines and Resources?

Mr. MacDonald: Oh, I have got friends all over the place, along with enemies, in uneven quantities. Notwithstanding these compensation payments a very deep sort of human instinct prevailed; it is an innate sort of conservatism, Senator Grosart; I do not know how you look at these things. They decided they just did not want to move and to some of these people it was a very emotional thing and the more any suggestion came along that they should

move, the more deeply convinced people became that they were not going to move.

The Minister and I made a visit there last summer and immediately ran into a torrent of criticism from the people living in Aklavik about all the points which we knew full well had led to the creation of Inuvik; the sewers did not work, the place was sinking, and so on. So the place is still there and there are still problems.

I might say today that I think we can be very glad that Inuvik was built, because it is now fairly conceivable that the Mackenzie Delta area will become a great oil centre, because the most active oil play going on right now is in the Mackenzie Delta and Inuvik will make a natural base of support that would otherwise have grown as a hodge-podge, a shanty town.

It is a very splendid community, which seems to have been just sort of waiting in the wings for something like this to come along.

The Chairman: But since most of your research in the field of the social sciences is done in universities and since in that field you only receive applications for grants, are you satisfied with this kind of undirected research?

Mr. MacDonald: I should qualify that, senator: The grants program is an undirected grants program, although we have had a lot of debate internally.

My previous Minister was not satisfied about the totally undirected nature and there is a really legitimate debate here going on as to whether it should be directed or undirected and if you have a mix what the mix should be. I think we will probably make some changes.

We do commission specific studies; the Hawthorne report on the whole Indian program was a commissioned report. You can probably think of others that we have had; we do commission individual people or universities to do studies that we want.

I would be wrong if I left the impression that we rely solely on it. The grants program is merely one instrument in the way of supporting it.

The Chairman: So again in that field of social science research you are satisfied at the moment that you do not have too important gaps?

Mr. MacDonald: We have the tools if we want to use them; if we are not using them, then it is an error on our part. For example, on this question of living in communities in the close confinement of the north,

which I think either we or CMHC are doing, or we are doing it jointly; CMHC is doing it and we have been working together with them. We both recognize that there is a problem which we have an interest in; they are the housing authority, we have to live with a lot of the consequences of municipal structures, of political repercussions, with people living in these circumstances.

We think this is a very big field of sociological research which CMHC is carrying out and we are participating by being interested observers.

Senator Grosart: Mr. Chairman, I am sorry, I have to leave to go to another meeting, but in view of the fact that Mr. MacDonald referred to innate conservatism I am sure you will not mind my reminding the committee that it once produced a great vision.

The Chairman: It was in the files; I know the history of that. Some people wanted to raise some questions about the Indian problems.

Senator Hays: How much research is spent in your department in Indian affairs? I have not done my homework very well; it is probably in here.

Mr. MacDonald: I have not done it much better; I do not have the budgetary figures.

I mentioned the Hawthorne report, which was a very major study directed on the whole program and on top of that we have a lot of specifics.

Mr. C. I. Fairholm (Director, Policy, Planning and Programming; Department of Indian Affairs and Northern Development): Mr. Chairman, honourable senators; we have had a few very large ones.

Senator Hays: What did the Hawthorne one come to, just to show the magnitude?

Mr. Fairholm: The Hawthorne study came to \$240,000.00. We also used the Canadian Correctional Associations and you may have read the report. That would be in the nature of \$67,000.00. There have been a number of other ones.

There is one now I think that the universities engaged in on educational problems, a study of the children moving from kindergarten and primary school over a period of time to get an assessment of progress, the use of Indian teacher aides and this sort of thing. It has been primarily though, I think, the use of university staff. These were, of course, directed in the sense that we sought out the universities to do the work.

There are, of course, some proposals that do come to us and within the financial limits that we have, some assistance was given.

Senator Hays: I wonder sometimes how qualified universities are to make Indian studies. I have neighbours; I have lived beside the Sarsee, Senator Gladstone, all my life. Then when I purchased my first ranch I was beside another reserve. I have great respect for the Indian people, their culture and their way of life.

On the other side I have neighbours that have ten or twelve sections that keep as many as 180 people; they keep them well. I am wondering if there has been any research, or any thinking about doing any research into taking some of these better reserves and using them as probably a pilot project, whereby you would instead of having the Indians dispersed all over the reserve in small houses and so on, where it seems to me they want to be together, that you set up a proper town and run their reserve in the way you would run a big ranch or something like that, which are paying a lot of them very handsomely.

I have often wondered about this, ever since I was a boy, why this would not be done. I am sure if you give me a Sarsee reserve I can keep all of the Indians drunk all of the time, Senator, and keep them in pretty handsome quarters, because they have some excellent land, and probably do it with Indian labour.

Mr. MacDonald: This is part of the Indian program; it is called physical development, but there are two aspects. One, physical development of the resources; the other is in the area broadly speaking of community development, which deals with the people themselves and attempts at motivation.

The Chairman: Do you not think, though, and you are not responsible for this, but do you not think that we have been terribly late in devoting research to these problems? I presume that we are just starting?

Mr. MacDonald: I do not think you could single out research as being a late starter Senator; the answer has to be late, but I qualify it and say not only on research, but late on a great many other things.

The Chairman: No, but we relied more or less on welfare hand-outs and all this for quite a while.

Mr. MacDonald: In 1945 the total expenditures of the government of Canada, including health, on Indian programs was \$5 million.

In the year coming up it is \$175 million, but that rush has been in the last decade. Education: It is because the problem grew like Topsy; it was a neglected society. You could debate the proportionate interest of the Indian people themselves in Canadian society, what started first, and what affected what, all of which is in a sense academic now.

It is a fact that the result is an enormous gap between the general average of the Indian people and the rest of the country; it is visible, it is manifest wherever you want to go and we are rushing very hard to catch up. A great deal of catching up has been done, more than has been appreciated. Indeed, what is happening, what we are hearing today is an index of the success because as you have more education you get more articulation and more self appreciation of what these problems are, and it leads to the things Senator Hays has been talking about, recreating the physical environment, the spiritual environment of Indian communities. It means movement into participating in the rest of Canada wherever that seems appropriate, and it is a free choice.

Senator Hays: You see, Mr. MacDonald, where I have my ranch there are four people who use Indians, I suppose maybe 70% of their help are Indians. They are excellent workers; they do certain work very well; they like to do it; they are loyal and in certain jobs they are very dependable.

These four places that I speak of are very successful; their land is no better than the reserve from which they come every day. It seems to me if this is being done, there does not seem to be any evidence of change that you can find as you look around; they are exactly the same, their houses are a little better, but not too much better than they were, say, 40 years ago.

Mr. MacDonald: Let me tell you the story right now of what is happening and why it is as you suggest:

I mentioned the great gap and the historical record where we are today, but going within that the first emphasis was on education, which I think everybody would agree was the sensible place, and that is where most of the money went. 50% of our budget goes on education. That is the first point as a starter.

The next priority was housing, because that is the raw minimum of life and it goes right back if you want, if you do not want to be sentimental about the people living today, you look at the child of tomorrow and that child going to school; you are trying to have him integrated in the provincial system where everybody else is. If he comes from a hovel, he is not really

having an equal start, so the housing program on the reserve came into being.

Finally, there was a gradual modernization, humanitarianising, I suppose, of the welfare system, which is simply a negative thing, the relief of distress in the absence of gainful economic opportunities.

What has happened in the last period of five years or so when there has been a great drive on is that the programs which would get at the economic opportunity for the Indian have suffered because of almost fantastic growth in costs of the educational and welfare programs.

This dilemma is a thing we are wrestling with now; even though our budget has grown way above the average of any other department of government, we still have never been able to get successfully off the ground a program of sufficient magnitude to cover the reserves.

We know, for example, that there is enough arable acreage in Indian reservations to support something like 4,000 people.

Mr. Fairholm: It would probably be about 8,000 people, maybe about 1,600 farms of an economic size.

Mr. MacDonald: But to do that, this means training, investment of capital, and so on.

Senator Hays: Maybe this is not the answer; who were the personnel you had on the Hawthorne study, for instance?

Mr. MacDonald: The Hawthorne study is a study which we received as a branch and as a department and we have made our recommendations on it.

Senator Hays: Who were the personnel? I wonder sometimes how qualified these people are to deal with this situation.

Mr. MacDonald: They were professors at UBC.

Senator Hays: Would it not be a lot better to have a farmer that has worked with them all his life, side by side, and made his farm successful? I do not know why you do not use this sort of personnel.

Mr. MacDonald: We do; I think you have to have many techniques. What the Hawthorne people did compared to the studies we get was a first rate study. What they brought was a professional capacity to study complex problems, sort them out, cause and effect, and give some reasonable recommendations.

It so happens, and you will be interested in this, that the one recommendation of the Hawthorne report we

are not accepting is the one on agriculture. They recommended that we not pursue this, but we sat back and looked at it and said it is just impossible to ignore an asset that could give gainful employment, not just marginal, but really successful, and we are not accepting that. We will go to other people.

Senator Hays: You take the amount of property we have in most of the reserves today, properly managed; we cannot all be managers, there are just a few people that are, but it seems to me that a board of directors made up of Indians at the Sarssee reserve can work if they want to work, but that this can be self-sustaining.

Mr. MacDonald: The only other argument I have heard about on the agricultural side, and one we have to approach with some caution, is that the capital investment required for a person employed is very disproportionate; that is the only one we have to mention.

Senator Hays: Yes, but I am not thinking of little, individual farms; there is no way that they can make it today. No farming industry can be made out of these little farms; they have to be vast, big farms.

Mr. MacDonald: Yes, but if we multiply, what is it, 4,000 units, say about 1,600 major farm units and multiply the individual capitalization that is required to make them a viable economic unit in today's terms, you have a very large sum of money.

What we have to calculate is the number of people who would be gainfully employed as a consequence of that investment as against other kinds of investments we could make, and how many people would be gainfully employed.

Senator Hays: I am not much of a Communist, but let us take the Hutterite community, who work 4 hours a day and on ten sections of land, or 10,000 acres of land. They are keeping 160 people much better than the Indians living in one little community.

Mr. MacDonald: Well, Senator, I do not think we are disposed to argue the point; we think that this is one that has to be looked at.

The Hawthorne recommendation was not to pursue this avenue; we think it holds out too important a potential at least to ignore and we are looking at it.

Senator Hays: Mr. Chairman, can the Hawthorne report be distributed to the committee?

Mr. Fairholm: We could certainly check on our supply.

The Chairman: At least you could send a copy of it to Senator Hays.

Mr. Fairholm: The first volume runs around four or five hundred pages.

In answer to the point you were making, Mr. Chairman, this experiment is being made in Alberta; there is a trust established just north of Edmonton on one of the reserves, I think it is the Alexander reserve, where there are three or four farmers right around the community and successful farmers who joined with members of the Indian community to develop a parcel of land.

They are breaking so many acres per year and they are trying to bring to this the best advice they can possibly provide at that place.

At another one they also brought in some of the university people from the University of Alberta.

The Chairman: What about the cooperative formula?

Mr. MacDonald: I do not know how extensively we have used it in the Indian area, other than in the sense that many of the bands, you might bear in mind, are communally owned in the sense of cooperative by the purest definition.

We have used it very successfully, of course, in the Eskimo side in the Arctic production; this has been the standard technique.

Have you anything to add to that?

Mr. Fairholm: There are a few what you could call bands operating farms or cattle herds, just the odd one; this is a sort of cooperative effort, but more on the band hiring some managers to actually operate the farm or the herd.

Mr. MacDonald: But it has not been a prominent feature.

Mr. Fairholm: No.

The Chairman: As a result of the recent improvements in educational facilities and accessibility to education, has there been any study made about whether or not there is a generation gap developing?

Mr. MacDonald: I do not know that we have studied it, but I think we perceive that it is not too dissimilar to what you find in the rest of society. It can indeed be there subject to even more pressures because the reserves represent a certain psychological phenomenon that is very deep and very important to

a generation of Indians, and others move out more than the average.

It is a little bit different to go in from the small town to the big city, which is the normal phenomenon of Canada's progression from rural to urban areas.

The Chairman: It would seem to me that it would be very interesting to make studies about this, because if there is a developing gap then the government may try at the moment to solve problems which in the next five or ten years will not be there any more and we may be faced with another problem.

Mr. MacDonald: I will put it this way: We have not found the necessity; we know it is there and even do not have to measure it. We have to recognize it; just as you say, it could have the effect of changing the parameters of the problems in the course of time and we look at this because it affects the out migration from reserves, it affects the question of values which are placed upon education or upon physical development of communities and so on. We are conscious of it without having been precise.

The Chairman: But I think it would be worth while not only to be conscious of it, but to mention the main dimensions of the problems and all this. I would hope that at some stage when you have more money you would devote some of it to that kind of research, which I think could be very fruitful in planning ahead for the future policy of the department.

Senator Hays: The problem of the small farmer in Canada today is the problem that the Indian had long ago; there was no way when you look back that he could have resolved this problem, because you had him out on a hundred acres with no equipment. There was no way. Now we find out that every small farmer is in exactly the same position and the only answer to it is for him to become large, but there just are not 350 thousand managers in Canada to run farms.

Senator Bourget: Is the Manpower and Immigration Department working with you in that regard?

Mr. MacDonald: Yes, very closely. We, as in the question of research, try to be a consumer or a customer of services as far as we possibly can. Our basic policy with respect to Indians and Eskimos is to have them treated like ordinary citizens of the country and have available to them and have them make use of the ordinary facilities. We only come in where there are some things which do not fit the national pattern, certain age and skill levels and so on, which have to be brought up before they become available.

We work in every region very carefully on this basis.

The Chairman: They are in Manpower and Immigration doing current studies on Manpower in so far as Indians are concerned; this is done, I presume, in close collaboration with you?

Mr. MacDonald: Yes, we act as a catalytic agency and bring to their attention the desirability of doing this and ensure that they have our close cooperation; there are no problems.

Senator Hays: Do your studies in this regard indicate that the Indian is better suited for urban life or rural life?

Mr. MacDonald: I do not think one can generalize, Senator, about an Indian born in Toronto, growing up in an ordinary school system; it is a cultural thing. It depends on what you have inherited by word of mouth and how you grow up and so on; that is what makes you what you are.

I know happily a great number of Indians and they vary as much as we all vary here. There is this cultural thing; if you have lived in an atmosphere which is highly seasonal, very sporadic even within the season, highly irregular and so on, adjustment to regular hours is difficult, we often hear this brought up and it presents more acute problems.

But I find this is true of other Canadians; there are a lot of people who are better fitted to be salesmen on the road, they just cannot stand being in an office.

Senator Hays: But if 60% of the people were on the land 40 years ago and only 12 today, would the same ratio not probably apply to the Indian as well? Should we be trying to keep him out there?

Mr. MacDonald: We are definitely not trying to keep the Indian anywhere; what we are trying to do is to increase his capability to make a free choice that is really meaningful. That is education, housing, which gives them the environment. We may be physically reconstructing a reserve, not because we think that reserve is an economic unit, but they are living there and you have got to break the cycle. Then a successor generation will make its own decisions as to what it wants.

I have heard much of the discussion on material civilizations and so on; I really find that this is a very confusing argument, it mixes up the cultural argument, but there is no necessary connection. Some of the greatest cultural advances have been made on a solid material base and very little without it.

We feel that our job is to ensure that the Indian person has a free choice, but a meaningful choice. Someone who today is living in northern Manitoba may still be living in the traditional way of life, in fur trapping and so on, but it is maybe disappearing from him. You may say that he has a free choice to pop into Winnipeg tomorrow and get a job, but it is not really a meaningful choice; it is not truly free.

There are a great number of intermediate stages that have got to be looked at and he has got to be helped, just as the small farmer we talked about a moment ago had to be helped by society as a whole, then the Indian has to be helped to break out of some of these cycles.

Senator Gladstone: May I in a short way explain what I have seen in the last 25 years, Mr. Chairman? I have worked for the Indians in Alberta and also down here as much as I could but, as Mr. MacDonald mentioned a few minutes ago, some years ago, specifically I know it is 1947 when the Director of Indian Affairs at that time, Mr. Hoey, got up in a committee room down here and said, "All I get from the Government is \$5 million to take care of all the Indians on the reservations, when I could spend \$15 million and that would not be enough."

Now, since then there has been a lot of difference; money supplied to the Indian work has been getting more and more every year, which today is a very big sum of money, but I have taken trips throughout the country since my appointment, take for instance in Toronto there are about 5,000 Indians living right there and I know they can go back to their reserve any time they feel like it, still they have grown up and had families and inter-married in the community and very few of them even think of their reserves now.

Now, that is the best example of people who can integrate; I am very happy that in the last 3 or 4 years something that I have asked and asked for to help those who are wanting to live in the city like white collar workers and so on were getting enough money. Where they were paying \$130 rent every month that some help be given, not gifts, but a fund so that they can borrow the down payment on a home.

It took quite a long time before this really materialized, but now it is the policy in order to encourage them to move into the cities. I am talking about the white collar workers who have had education, dependable people who have moved away from the reservations, who now do have a grant to help them build their own homes.

Now, those sort of people are going to raise their families in the cities and they are going to just be absorbed in the community, because the children grow up and go to school with the others and from what I

have seen there is no discrimination or anything like that; they get along fine together, whereas before there was always this behind them, well, we get this education and go back to the reserve; what good is that to us to make a living on our reserves?

To me in the last two or three years it has been a lot different and I feel very happy about it. As time goes on and there are more Indians going on for higher education they try to beat one another, while those who are leaving the reserves now to get work because it is easier to live in the cities or towns, get in with the wrong bunch of people. That will in itself I think cure the malady, getting better association with people as they themselves are better to mix with people around them.

As far as Toronto is concerned I never hear so much about Indians being in ghettos and all that; this happens all over. I do not think the Indian was born lazy; I went up north last year to see what a little urging done ten years ago when they were getting relief had done. They did not want it, they wanted work, and I said, go out and chop these trees down and clear your land, that will be working for your relief and when the government sees you are doing this they are going to help you, there is no doubt about it.

Last year when I went up there around Battleford, and north of Battleford, places that I travelled through, there was wheat and grain growing on each side of the road.

Those Indians, once they had a little coaching and a little urging, they went right ahead.

The same happened in Manitoba, so that is what they need. If the proper people get to take care of us, that is to say coaching us, it makes a lot of difference in the results of how the thing works out.

So I myself am happy, but the people are beginning now; it will take a generation I guess. Some of the 40 year olds and those who cannot ever get out and get jobs except using their hands well, when they are taken care of the younger generation are not going to be a burden to anybody until they are old enough to be taken care of. That is the way I see it; I will not be here to see it, but I am not a bit pessimistic about it. I think, as the Minister told me, the big need I can see is the cost, the money, that is what is needed. I know more and more money every year is being spent, and I do not think it is going to be a bad investment for Canada to do this.

The Chairman: Thank you very much, Senator Gladstone.

On this very encouraging note I think this is perhaps the most appropriate time to call this meeting to an end, but before doing so I certainly want to thank Mr. MacDonald and his colleagues for this very active discussion this morning and for their brief.

You have before you three very important challenges: To serve our wildlife; to help the native people of Canada; and to develop the north.

We certainly hope that you will be most successful on the three points.

Mr. MacDonald: Thank you very much, sir.

The committee adjourned.

APPENDIX 32

BRIEF

TO

SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

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INTRODUCTION

The Department of Indian Affairs and Northern Development presents a mosaic of activities and responsibilities. The varied responsibilities which had been combined in the Department of the Interior until 1936 were re-united in 1966, when the Department of Indian Affairs and Northern Development came into being. In response to this regrouping of functions, an internal re-organization of the Department was planned and carried out, becoming effective in September 1968. In the re-organized structure, the substance of departmental responsibilities has not been altered, but the manner of discharging these responsibilities has been changed in favour of greater functional specialization. The new organization of the department is described in Appendix A. However, when this report was prepared, departmental plans, budgets, and staff estimates were still based on the old organization, and therefore it was necessary to prepare the brief on the basis of the organizational framework in effect prior to September 1968. Departmental responsibilities were then discharged by the organizational units listed hereunder. Some of these units have undergone little internal organizational change and retain many of their former functions, while others have been entirely re-organized or replaced.

The Northern Administration Branch was responsible for the administration of the people and natural resources of the Northwest Territories and the Yukon Territory, and for the administration of Eskimo Affairs. This branch also administered the ordinances and regulations concerning education, health and mining safety on behalf of the Council of the Northwest Territories.

The Indian Affairs Branch was responsible for assisting Canadian Indians to participate fully in the social and economic life of Canada. Under the authority of the Indian Act, specific programmes were undertaken in the field of education, social welfare and community development.

The Resource and Economic Development Group was responsible for the management of northern non-renewable resources and for fostering the economic development of the North. The primary tasks of this Group were to develop

means of expanding the northern economy and of increasing the rate of non-renewable resource production; to identify attractive investment or development opportunities for both private and public sectors; to identify the factors which influence investment in the Canadian North; and to recommend policies which, by improving the opportunities for profitable returns in all fields, would accelerate the rate of capital spending in the North.

The National and Historic Parks Branch administers the National Parks of Canada and Canadian Historic Sites, under the authority of the National Parks Act and the Historic Sites and Monuments Act. The National Parks of Canada are areas preserved for, and dedicated to, the people of Canada for their continuing benefit, education and enjoyment. The Historic Sites Division is specifically concerned with the commemoration of events and people and the preservation of buildings which played an integral part in Canada's growth.

The Canadian Wildlife Service, under the authority of the Game Export Act and the Migratory Birds Convention Act, conducts research on Canadian fauna, and maintains liaison with international, national, provincial and private agencies and organizations which deal with wildlife.

The Northern Science Research Group conducted and co-ordinated research on northern subjects, encouraged research by non-governmental agencies, collected and disseminated technical and scientific information on the north, and operated the Inuvik Research Laboratory. These functions will continue to be performed within the new Community Affairs Branch.

With regard to the emphasis on research in each of these organizational components, it will be evident from this report that the Canadian Wildlife Service and the National and Historic Parks Branch have shown a strong research orientation, being the two departmental units with administrative responsibilities in which research played a major role. For this reason, the submissions of the Parks Branch and the Wildlife Service make up the major volume of this brief. At the same time, the Resource and Economic Development Group and the Northern Science Research Group also conducted substantial amounts of research, primarily in the social sciences, while the Indian Affairs Branch and the Northern Administration Branch conducted little research themselves but arranged

for some research to be conducted under contract.

Since research activities within the department covered such diverse fields as wildlife and education, it was felt that presentation of the reports of individual organizational components would present the most accurate picture of the role of scientific research throughout the department. Data which have been tabulated for the department as a whole pertain to scientific personnel; the appropriate tables follow this introduction.

This brief was prepared during the period of re-organization, and this made the task substantially more difficult. Hopefully, nonetheless, the information presented will meet the needs of the Senate's Special Committee on Science Policy.

J.A. MacDonald,
Deputy Minister.

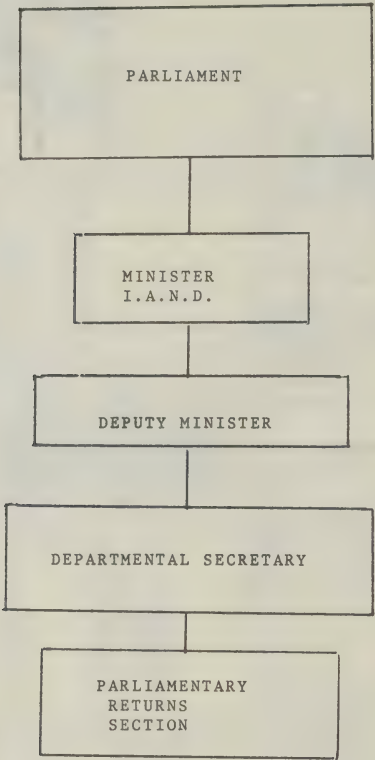
2.1 Departmental Organization

and

2.5 Departmental Personnel Statistics

(Personnel statistics for each
Branch will be found at the end
of the individual Branch
submissions.)

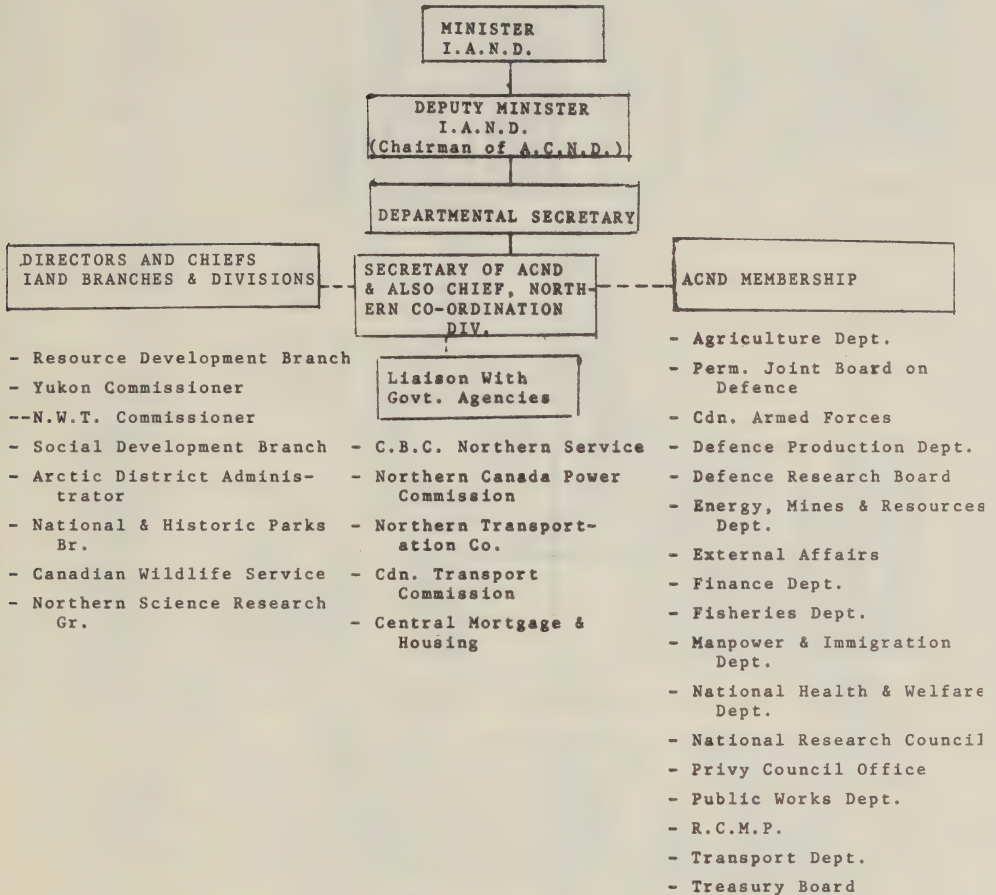
2.1.b. Parliamentary Reporting Channels and Formal Connections
to Other Federal Agencies, etc.



2.1.b.

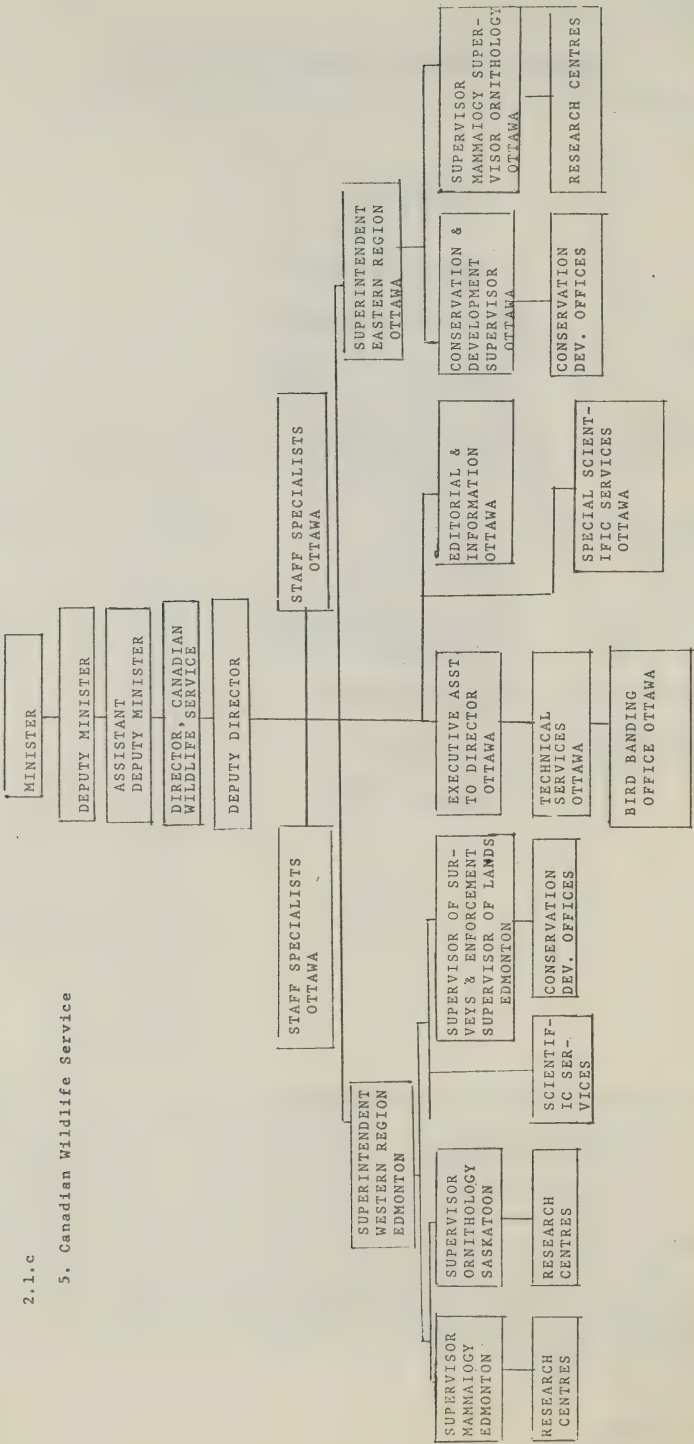
ADVISORY COMMITTEE ON NORTHERN DEVELOPMENT

(Established in 1948 as part of the Privy Council Office)



The Advisory Committee on Northern Development is a policy recommending committee. The Deputy Ministers of the departments listed under "A.C.N.D. Membership" are the formal members of this Committee. For the major departments the Deputy Minister often attends, and for the associated departments the appropriate northern official is sent as the representative. Full meetings are held at least twice each year. As well, sub-committee meetings are held to investigate specific questions. Consultation with the several government agencies listed above is also carried out. Lateral communication within the department is carried out at the Branch Director and Division Chief levels.

November 15, 1968.

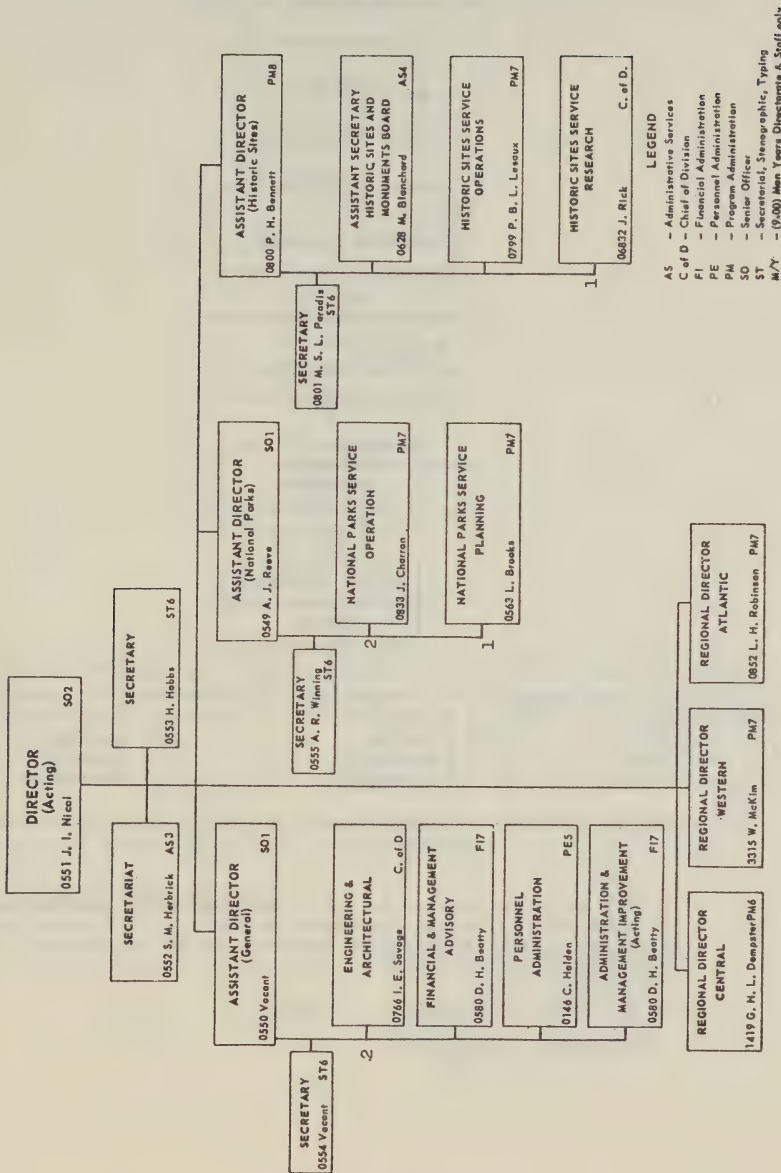


The responsibilities of the Canadian Wildlife Service include management and research on birds. It also supplies advisory services in relation to wildlife in the national parks and the Canadian north, and undertakes fundamental research to support the management of wildlife under provincial jurisdiction. All units are directly or indirectly concerned with research or research administration.

2.1.c

National and Historic Parks Branch

NATIONAL & HISTORIC PARKS BRANCH
BRANCH ORGANIZATION CHART 1968-69



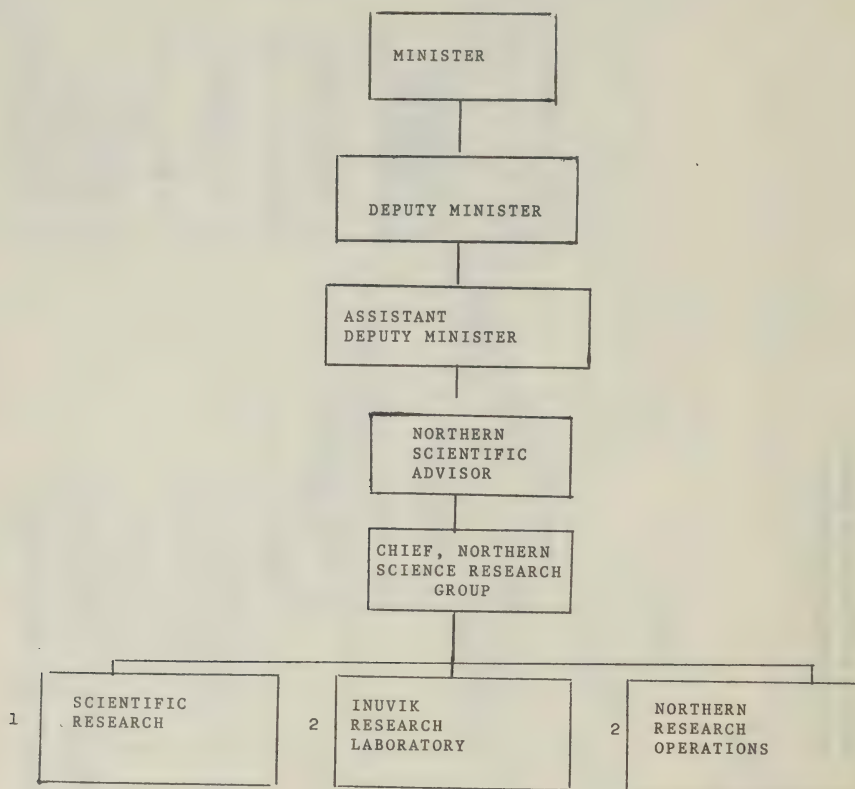
There are four main divisions within the Parks and Historic Sites Branch: Research Division, Planning Division, Interpretation Section, and Engineering and Architectural Division. Its main responsibility is in the rational planning for the preservation and utilization of a system of national parks and historic sites.

1. -Substantial Scientific Research
2. -Incidental Research

Special Committee

2.1.c.

Northern Science Research Group (formerly Northern Co-ordination and Research Centre)

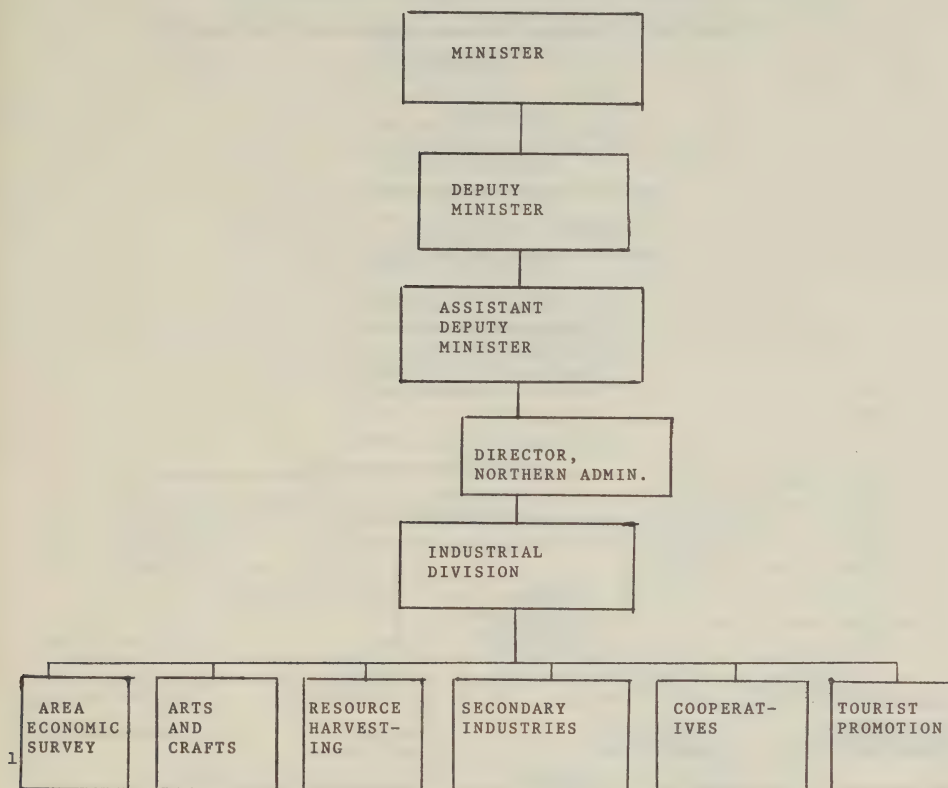


The Northern Science Research Group conducts and coordinates research on Arctic and sub-Arctic areas. It has formal and informal ties with the other branches in the Department, with other Departments, and with Universities and private institutions throughout Canada.

1. - Substantial Scientific Research
2. - Scientific Support

2.1.c

Industrial Division, Northern Administration Branch

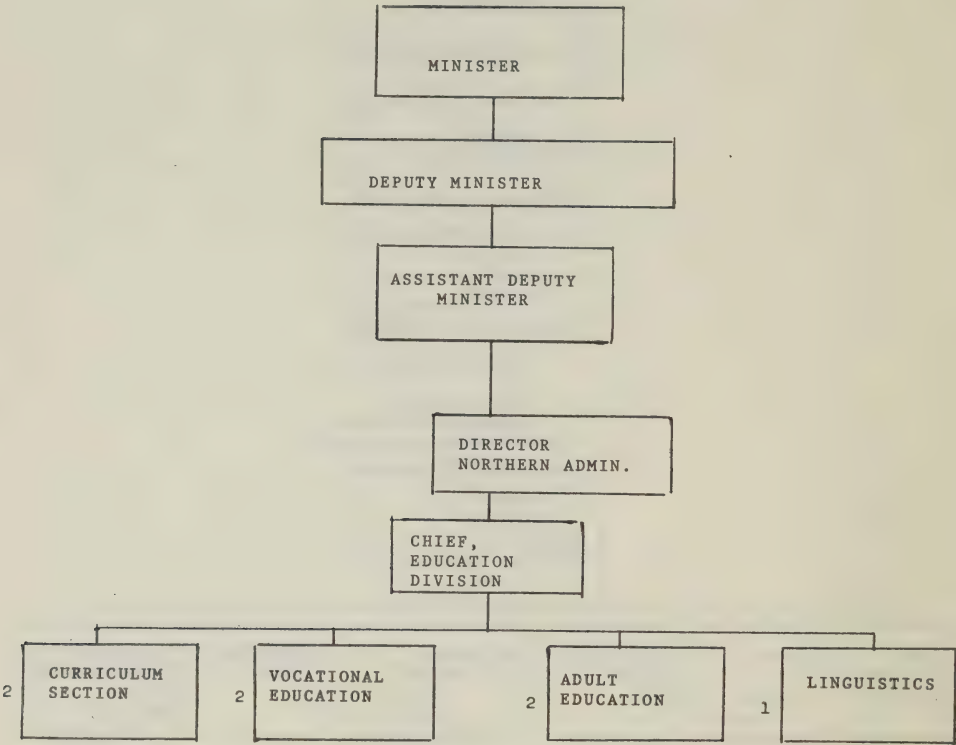


Area Economic Surveys section is responsible for doing research in economic geography in all northern regions.

1.- Incidental Research

2.1.1.c Block Diagrams of Units Responsible for Scientific Activities (Support services and units solely concerned with extramural research are not included).

Education Division, Northern Administration Branch

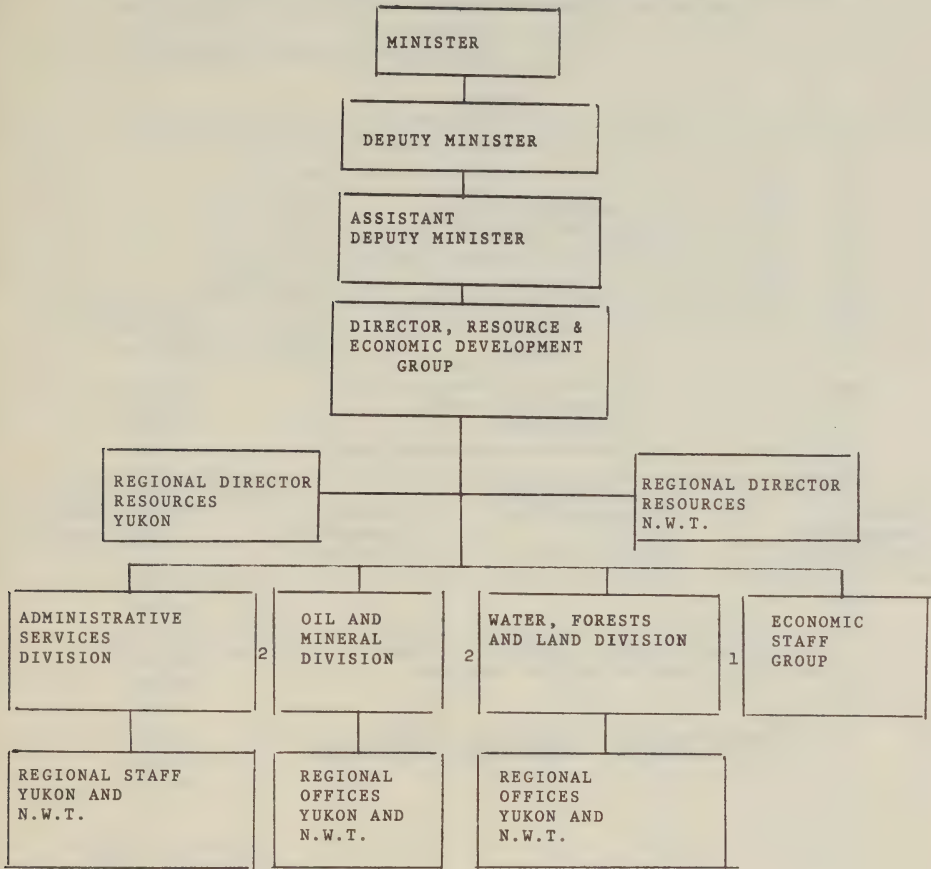


Section heads employ a specialist staff to design programs and collect information basic to program design and implementation. Their responsibilities are dual in nature, and include research and applied skills.

- 1. -Incidental Research
- 2. -Only contract studies by outside agencies

2,1.c

Resource and Economic Development Group

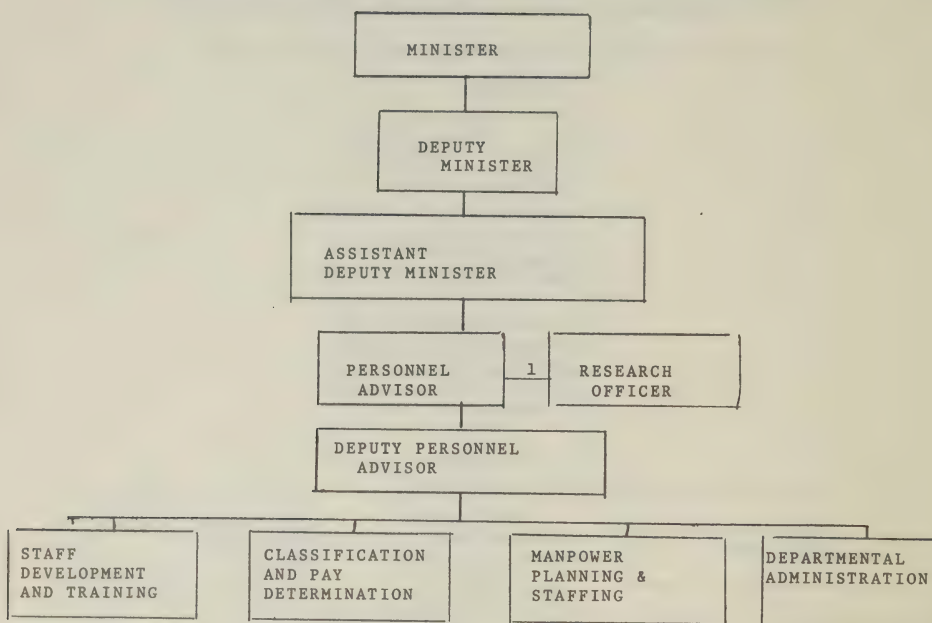


The Resource and Economic Development Group is responsible for management of northern renewable resources and for fostering the economic development of the north.

1. - Substantial Scientific Research
2. - Only contract studies by outside agencies

2.1.c

Personnel



Personnel is responsible for manpower development and the formulation of policy designed to develop most effectively human resources within the department.

1. - Substantial Scientific Research

2.5.c. CHART I - B.A. Department of Indian Affairs and Northern Development

B.A.'s employed by the Department of Indian Affairs and Northern Development by country of birth and country of training

Data include research staff only.

Country of birth	Canada	India	England	N. Ireland	Scotland	U.S.A.	Poland	Latvia	Netherlands	Germany
Country of Training										
Secondary Schooling										
Canada	49					1	1	1	1	
India		1								
Wales			1							
N. Ireland				1						
Scotland					1					
U.S.A.						4				
Poland							1			
Germany										1
Netherlands									1	
England			1							
B.A.										
Canada	44	1				1	1	1	2	
England	1		1	1						
U.S.A.	4					4				
Wales			1							
Britain					1					
Poland							1			
Germany										1
Able to operate effectively in both languages	8		1				2		1	1

2.5.c CHART I - M.A. Indian Affairs and Northern Development

M.A.'s employed by the Department of Indian Affairs and Northern Development by country of birth and country of training.

Data include research staff only.

	Country of birth	Canada	Yugoslavia	Holland	England	Scotland	U.S.A.	Australia	West Indies	S.W. Africa	Germany	Hungary	Phillipine Isl.
Country of Training													
Secondary Schooling													
Canada	42				2	1	1			1	1		
Yugoslavia		1											
Holland			2										
U.S.A.	2				5		11						
England						1							
Scotland								1					
Australia									1				
West Indies									1				
Hungary												2	
Phillipine Is.													1
M.A.													
Canada	34	1	1			1	1	1	1	1	1	2	
U.S.A.	10		1		4	1	11						1
England					3								
Scotland						1							
Able to operate effectively in both languages	10		1	2		1							

2.5.c. CHART I - Ph.D. Department of Indian Affairs and Northern Development

Ph.D.'s employed by the Department of Indian Affairs and Northern Development by country of birth and country of training.

Data include research staff only.

Country of birth	Canada	England	U.S.A.	Netherlands	India	Kenya	Poland
Country of Training							
Secondary Schooling							
Canada	20	1					
England		2			1	1	
U.S.A.	1		3				
Netherlands				1			
India					1		
South Africa							1
Ph.D.							
Canada	13	2	2	1			
U.S.A.	5		1		2		1
Australia	2						
Finland	1						
England		1				1	
Able to operate effectively in both languages	3	3					

2.5.c CHART II IAND

Average number of working years since graduation and average number of years employed in present organization of B.A.'s, M.A.'s, and Ph.D.'s employed by the Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

Age Group	B.			M.A.			Ph.D.		
	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization
21-25	17	2.07	1.78	3	1.33	1.33			
26-30	12	4.05	1.83	22	2.55	2.28	3	2.60	2.60
31-35	7	7.42	3.71	17	6.00	2.88	5	4.50	3.20
36-40	10	9.90	5.45	15	7.43	3.73	9	4.22	7.22
41-45	6	13.16	5.66	7	12.71	11.57	9	6.22	13.33
46-50	7	13.71	3.90	7	17.43	10.28	1	13.00	15.00
51-55	3	23.66	12.00	2	18.50	11.00	4	16.00	5.87
56-60	2	15.15	10.15	1	31.00	14.00	1	3.00	19.00
61-65	0	0.0	0.0	1	14.00	2.50			
65	1	40.00	5.00						

2.5.f

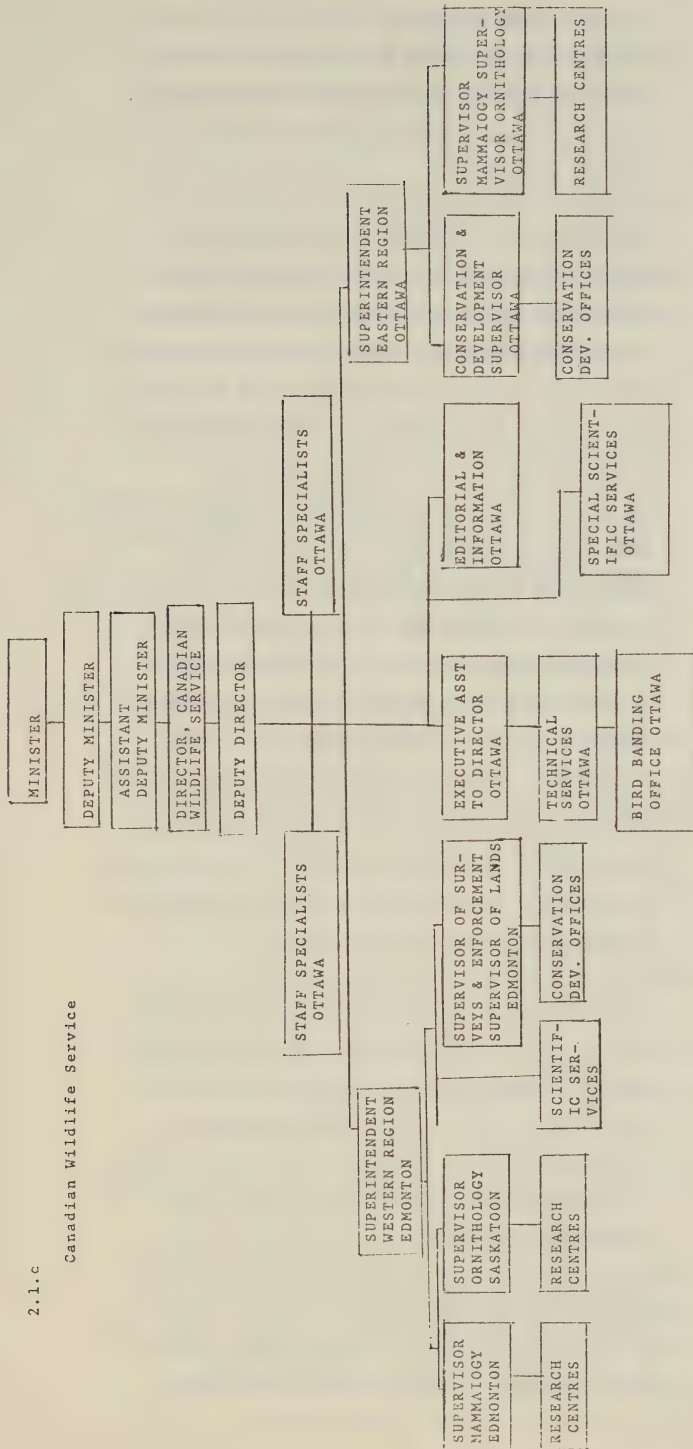
Percentages of research scientists employed by the Department of Indian Affairs and Northern Development previously employed by private industry, universities, provincial agencies, and other federal agencies.

	Percent previously employed by private industry	Percent previously employed by universities	Percent previously employed by provincial departments or agencies	Percent previously employed by other Federal agencies	
Personnel Adviser (1)	0	0	100.0	0	
Financial and Management Adviser (7)	80.0	0	0	50.0	
Indian Affairs (5)	33.3	0	0	66.6	
Library (5)	0	66.6	0	66.6	
Resource and Economic Dev. (9)	33.3	33.3	22.2	55.5	
Canadian Wildlife Service (98)	7.8	18.6	35.2	8.8	
Parks and Historic Sites (37)	10.8	21.6	16.2	13.8	
Northern Science Research Group (10)	10.0	30.0	20.0	30.0	
Northern Administration (3)	66.6	66.6	66.6	66.6	
Total for Department*	14%	22%	27%	19%	

*Department percentages calculated by summing weighted Branch percentages.

Numbers in parentheses indicate number of individuals in each division.

BRIEF
TO
SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
Canadian Wildlife Service
December 1968



The responsibilities of the Canadian Wildlife Service include management and research on birds. It also supplies advisory services in relation to wildlife in the national parks and the Canadian north, and undertakes fundamental research to support the management of wildlife under provincial jurisdiction. All units are directly or indirectly concerned with research or research administration.

INTRODUCTION

The Canadian Wildlife Service carries on a number of activities in respect of migratory wildlife in co-operation with agencies of foreign governments.

The Migratory Birds Convention (1916) is a formal agreement between the United States and Canada which provides for the protection of migratory birds. While it makes no specific provision for scientific activities such as are required to provide an information base for various protective regulations, co-operation with the U.S. Bureau of Sport Fisheries and Wildlife in studies of the population status and movements of migratory birds has been a significant activity since 1949, and began even earlier. Co-operation takes the form of participation in the planning and carrying out of regular surveys of populations, mortality and distribution studies based on the banding of birds, and the regular exchange of publications and reports based on those surveys and studies. Collaboration in the preparation of publications is not uncommon.

International Technical Meetings on Migratory Birds involving senior officials of the governments of Canada and the United States are held from time to time. The Committee makes recommendations in regard to research. A copy of the Committee's most recent report is attached (exhibit B).

Studies of the life history, distribution and survival of the polar bear are being carried on by the Canadian Wildlife Service within a

frame of reference developed by an international committee on polar bears made up of representatives of Canada, United States, U.S.S.R., Denmark and Norway.

Studies of the population status and movements of barren-ground caribou in Alaska and the Yukon Territory have been undertaken from time to time in co-operation with the United States Bureau of Sport Fisheries and Wildlife.

(e) Not applicable:

2.2) Organizational functions

- (a) The Migratory Birds Convention Act and the annual Migratory Birds Regulations of that Act (exhibit C) form the statutory basis for research and management of migratory birds in Canada. Such activities are carried out in close co-operation with provincial governments. The Government Organization Act, 1966 gives the Minister of Indian Affairs and Northern Development jurisdiction, not by law assigned to any other department, branch or agency of the Government of Canada, relating to migratory birds and other wildlife. Under that authority the Canadian Wildlife Service undertakes studies in the National Parks, the Yukon and Northwest Territories, on Indian lands and on other federal Crown lands as requested.
- (b) The policies and programs of the Canadian Wildlife Service are described in the statement on Canada's National Wildlife Policy and Program, tabled in the House by the Minister of Northern Affairs and National Resources in April 1966 (exhibit D). The statement contains a number of passages which define policy in regard to those

branches of science that contribute to an understanding of wildlife and wildlife habitat, in short - the Canadian environment.

A general statement of policy is that the Canadian Wildlife Service will support and undertake fundamental research in support of wildlife management throughout Canada. Priority is given to research on migratory birds and their habitat, on wildlife in National Parks, and on wildlife in the Territories, those being areas for which there is a statutory federal responsibility.

Specifically defined researches on wildlife in the provinces is undertaken on request and by agreement.

Certain general areas of research are occupied by the Canadian Wildlife Service as a contribution to the interests of all jurisdictions. These include studies of the relationships between wildlife and forests, the health of wildlife populations, and the effects of pesticide-use programs on wildlife populations.

A scholarship program and a directed program of extramural research (related to the Service's responsibilities) support the professional training of biologists.

- (c) The Canadian Wildlife Service discharges all federal responsibilities in regard to wildlife, except for management of wildlife in the National Parks. Those federal responsibilities include:

- research on and management of birds referred to in the Migratory Birds Convention Act with the United States

- research on and provision of advisory services in relation to wildlife
 - in the National Parks
 - in the Northwest and Yukon Territories
 - in Indian Reserves
 - on other federal lands, e.g., airports

The Canadian Wildlife Service supports the management of wildlife under provincial jurisdiction

- by undertaking fundamental research
- by co-operating in management activities with the provinces on request and by agreement
- by providing information about wildlife to the public
- by developing and operating wildlife interpretive centres

The primary objective of the Canadian Wildlife Service is to ensure the preservation and wise use of wildlife resources under federal jurisdiction and to support the provinces and Territories in their efforts to achieve the same objective in respect of wildlife under their jurisdiction. Secondary objectives, met in part through research programs, are noted under appropriate headings below.

Migratory Birds

- to ensure the maintenance of migratory bird populations at levels in harmony with man's interests

Wildlife Research

- to provide the information and advice needed in support of wildlife management

Special Committee

in National Parks, Indian Reserves,
Territories and Provinces

Pesticides

- to determine the effects of pesticide-use programs on wildlife populations; to recommend changes in the use of pesticides so as to favour the survival of wildlife; and to promote an awareness of the unity of biological communities and of the possible consequences of the uses of pesticides

Pathology

- to assess the occurrence and significance of diseases and parasites affecting Canadian wildlife populations; and to recommend methods to combat and alleviate the effects of outbreaks of pathological conditions

Limnology

- to provide the information and advice needed for the management of National Parks' waters and fisheries so as to maintain adequate stocks of fish under natural conditions; and to control nuisance aquatic organisms

i) Relationships that have developed with other federal agencies in carrying out the functions and responsibilities noted above include the following:

- (a) Steering Committee on Ecological Studies in the National Parks formed to assist in the identification and conservation of ecosystems in the various parks;
- (b) Interdepartmental Committee on Forest Wildlife formed to further studies of problems of common interest to the Department of Forestry and Rural Development and the Branch;

(c) Federal Interdepartmental Committee on Pesticides, organized to further the co-ordination of federal government use of pesticides in a manner least harmful to the environment;

(d) National Research Council Advisory Committee on Bird Strikes formed to develop methods of reducing bird impacts on aircraft.

At present 14 of the Branch staff are seconded to ARDA to provide a wildlife input in the Canada Land Inventory, one senior biologist is on loan to the External Aid Office, and one to the Science Secretariat.

- ii) Relationships with industry are limited but growing, and arise mainly in relation to problems of environmental contamination.

Section 51 of the Migratory Birds Convention Act and Regulations prohibits the contamination of waters frequented by migratory birds by substances injurious to the birds. This provision has brought the Service in contact with various oil, mining and food processing companies that have from time to time been offenders in this respect.

There have been some contacts with chemical companies in regard to the use and characteristics of pesticides and herbicides. Some companies have supplied products for test.

There are occasional contacts with travel agencies, mainly to explain and publicize aspects of the Migratory Birds Regulations that affect tourist hunters.

There have been contacts with ammunition and metallurgical companies in connection with the development of a non-toxic shot for shotgun shells.

- iii) The Canadian Wildlife Service has developed a close relationship with a number of universities that offer courses in wildlife research, ecology, and related subjects. In respect of those universities, to varying degrees, Canadian Wildlife Service and university staff are in frequent contact on such subjects as employment of students, selection of permanent employees, contracts, and matters of mutual professional interest. Canadian Wildlife Service staff from time to time lecture or participate in seminars at universities. At present, Canadian Wildlife Service offices and laboratories are "on campus" at the University of British Columbia, the University of Saskatchewan, and the University of Ottawa, and are close to the Universities of Alberta, Laval, Mount Allison and Memorial. Close working relationships are maintained with the Universities of Guelph, Western Ontario and Calgary.
- iv) The Canadian Wildlife Service keeps in touch with related scientific activities in other countries by a continuous review of serial literature from all over the world and by attendance at various international conferences. Members of Canadian Wildlife Service staff are on committees of various international organizations. The degree of participation in

international activities varies to some extent in accordance with budgetary strictures,

Relationships with United States - based organizations are particularly close.

Attendance at meetings with those organizations is usually about as follows:

International Migratory Bird Committee	- once a year
North American Wildlife Conference	- once a year
Northeast Fish and Wildlife Conference	- once a year
Northeast Fisheries Society	- once a year
Alaskan Science Conference	- once a year
Atlantic and Mississippi Flyway Councils	
Meetings	- once a year
International Association of State Fish and	
Game Commissioners	- once a year

plus a number of professional organizations such as the American Society of Mammalogists, American Ornithologists Union, etc.

(f) The Canadian Wildlife Service's activities and programs conform closely to the policies set forth in the statement of National Wildlife Policy. That statement of policy elaborates and defines the statutory responsibilities conveyed by the Migratory Birds Convention Act and the Government Organization Act (1966). Most activities have not yet reached the level required to make reasonable progress toward objectives.

This is perhaps the appropriate place to comment on a significant gap in the government's research activities. There is no clearly specified place in the government's present organization for the conduct of research on the ecology of natural Canadian environments. This is not surprising since ecology as a recognized discipline is less than 50 years old. By its very nature, concerning itself as it does with interrelationships among living forms (including man) and between living forms and their physical environment, it is a science of synthesis and integration, difficult to fit into the compartmentalized structure of governments. It is the science that has come to form the basis for the art of wildlife management, indeed, for resource management generally, although unfortunately many other resources are still studied and managed as though they were independent entities.

Studies of the ecology of Canada's environments are important. Degradation by pollution, erosion, and impoverishment of large sectors of the

environment in which Canadians live and work is likely to continue until the interdependence of elements of the living environment is better and more widely understood and the primacy of the public interest in environmental quality recognized in word and deed.

Degradation of the environment is largely a consequence of the continuing industrial revolution and may be one of the little known but important factors contributing to the puzzling social disorders associated with affluence

The Canadian Wildlife Service, with its professional staff qualified, experienced and interested in ecology would be the reasonable niche for the development of this sort of work.

- (g) Ecological research is a slow business because of inherent difficulties. Basic data have to be obtained in a variety of environments, many being difficult of access and presenting logistic and operational problems. Many of the phenomena to be studied are seasonal. It may, for example, take five years to obtain a statistically acceptable sample of reproductive measurements. Much of the work is subject to delays and inconveniences resulting from adverse weather. Difficulties are presented by the need to deal with wild animals under uncontrolled conditions. None of these difficulties can be eliminated, but they are worth mentioning so that the pace of accomplishment in ecology can be appreciated.

The responsibilities are broad and the pace of accomplishment is necessarily slow. Provision of additional staff and funds would accelerate progress. Obtaining additional staff is not merely a matter of having the authority to hire: trained wildlife biologists and ecologists are at a premium. It will be necessary to stimulate people to enter the field by providing clear evidence that a reasonable number of employment opportunities will become available.

Perhaps the basic impediment to progress is insufficient public understanding of the significance of ecological research, and, therefore, limited public support for its expansion and intensification. However, there are obvious signs that the public is becoming more aware of the significance of ecological relationships.

Some difficulties arise from the fact that a number of agencies of both the Federal and Provincial Governments have jurisdiction over or varying degrees of interest in the many components of the environment. There is as a consequence both duplication of effort and complete neglect of important areas arising from imperfect understanding of responsibilities and incomplete co-ordination of activities. It seems unlikely that this problem can ever be completely resolved at the intergovernmental level, although it could be eased by the establishment of a body to co-ordinate planning and action. Perhaps the Canadian Council of Resource Ministers could meet that need. But before it can be met in any useful way, each individual government must ensure that it is internally organized to provide for proper co-ordination. Present arrangements in the Federal Government are far from perfect, with co-ordination between Departments largely in the hands of a number of ad hoc committees representative of interests that seem to see themselves in competition with each other.

Finally, for the sake of completeness and without any undue optimism we might mention the seemingly inevitable and eternal impediments of

bureaucracy. Failure to decentralize authority to the degree necessary to overcome interminable delays in management of funds and particularly personnel is the root of the problem.

- (h) The National Wildlife Policy and Program is only partly implemented and additional staff and funds are required if the potential is to be realized. A restructuring of the Branch is planned to achieve greater efficiency and effectiveness in meeting its responsibilities, particularly those involving migratory birds. The increasing concern for environmental quality, and the essential role that the Branch has in meeting the problems arising, will be recognized in the Branch functions.

The first wildlife research centre of the Branch is in operation. The need for additional such centres is recognized and plans are underway for their construction and integration in the organization's functions.

2.3 Personnel Policies

- (a) Contact in person and by correspondence is maintained with faculty members at Canadian and United States universities known to train students well qualified for work in the Canadian Wildlife Service. By this means promising students are identified. Often students of high potential are offered temporary employment or are indirectly employed through a contract with the university concerned, thus providing a further opportunity to evaluate their suitability and performance.

The University Recruiting Program of the Public Service Commission is also helpful, particularly in locating students at those universities where Canadian Wildlife Service contacts are less well developed. In the main, however, we are better able ourselves to evaluate potential employees by the means described above than are the Public Service Commission recruiting teams.

(b) No, but the process described above assists the Branch materially in identifying good researchers.

(c) In many cases such people identify themselves. This is really just a matter of getting to know people, offering them a variety of challenges in planning, undertaking and reviewing research, and observing their performance. We do not particularly regard research administrators as a new breed, although there are too few good ones around, and of those, most seem not to have had any special training. The research administrator, as one who stimulates, co-ordinates and criticizes, is a key figure, and often a much-maligned one. But the work of good research administrators benefits individuals, organizations, science and the public.

The universities should be contributing to their training. Though personal attributes and characteristics dictate whether a man will be a good research administrator, all researchers could well be exposed at university to the principles of research administration.

(d) Research administrators and researchers are classified as research scientists or biologists, depending on the individual's qualifications.

Research administrators are senior personnel, having achieved scientific distinction and are paid accordingly. Some researchers also have achieved the same level of distinction or exceeded it, and are paid larger salaries. The research scientists' salary schedule allows for such flexibility.

Promotion into the research administrator category is from the research scientist group. Promotion into senior levels of Branch program administration is generally from the research administrator category.

- (e) The Department offers training programs of many kinds, designed to improve the knowledge and efficiency of its administrative staff. Such training is offered through Departmental instruction, Public Service Commission courses, or at universities. Part or all expenses may be assumed by the Department.

2.4 Distribution of activities

(a)

	1963/64	64/65	65/66	66/67	67/68
Newfoundland	16,363	17,332	22,687	39,163	59,759
Nova Scotia	3,680	3,851	5,041	10,000	22,481
New Brunswick	38,816	40,617	53,165	75,590	181,811
Quebec	22,587	23,635	30,937	51,514	115,550
Ontario	573,523	600,347	785,805	1,820,659	1,608,007
Manitoba	9,704	10,154	13,291	23,270	34,741
Saskatchewan	83,054	87,013	113,894	238,255	656,294
Alberta	181,534	189,958	248,641	326,188	758,893
British Columbia	37,812	39,567	51,790	94,663	131,788
Yukon Territory	12,548	13,130	17,187	34,381	41,107
N.W.T.	41,488	42,893	56,144	108,046	136,380
Totals	1,021,109	1,068,497	1,398,582	2,812,729	3,749,811

No records available provincially.
 Figures obtained by pro-rating
 totals based upon 66/67 and 67/68
 ratios

Actual

Amounts represent province in which expenditures originated and not where eventually made.

(b) Certain scientific activities by their very nature must be regionally oriented. The prairies of Canada produce 70 per cent of the continent's ducks, for example, and therefore the research on such species is concentrated in Saskatoon. Most geese are produced in the Northwest Territories and therefore studies of populations are conducted there. The Territories also harbour wildlife of direct importance to Indians and Eskimos, as well as containing species of special scientific interest. In other words, where information about the ecology and life history of animals is required it is essential that scientists go to those areas where the animals naturally occur. Each region of Canada contains species endemic to it and the selection of scientific studies therefore is done on a basis of scientific or management need and only on a regional basis if the species requiring study is sufficiently widespread to warrant such consideration. Laboratory study of animals, of course, does lend itself to regional considerations.

(c), (d) & (e) These questions suggest that the scientific activities being considered are those which have a direct relation to regional economic development. Wildlife research does have such a relationship, but is indirect in nature and difficult to quantify.

2.5) Personnel associated with scientific activities

- a) Establishment - 199/2 seasonal
Vacancies - 24

a) People on strength by category of personnel

Senior Officer	1
Chief of Division	1
Research Manager	3
Research Scientist	24
Biologist	59
Statistician	1
Administrative Services	4
Program Administration	7
Technical Officer	12
Technician	13
F.I.	1
Clerical and Regulatory	22
Secretarial, Stenographic and Typing	25
Storeman	1
Administrative Trainee	1

Staff on loan 2

Biologist 5 - External Aid
Research Scientist 2 - Science Secretariat

Seconded to ARDA 14

(8 Biologists; 6 Technical Officers)

- b) Number of professional staff devoting most of their time to administrative duties - 4

- c) Professional staff associated with scientific activities by degree level, etc.

Degree level	i	ii	iii	iv	v	vi
B.Sc. (Bishop)	Canada	Canada	Canada	1)2 2)2	23 -	bilingual
B.Sc. (Anderson)	Canada	Canada	Canada	1)4 2)2	37 -	
B.Sc.	Canada	Canada	Canada	2	25 -	bilingual
B. Comm.	Canada	Canada	Canada	1)20 2)2	53 -	
B.SA	Canada	Canada	Canada	1)9 2)1	39 -	

Degree Level	i	ii	iii	iv	v	vi
B.A.	Canada	Canada	Canada	1) 7 2) 9	36 -	
B.S.A.	Canada	Canada	Canada	1) 4 1) 4	25 -	
B.A.	Canada	Canada	Canada	1) 18 2) 18	48 -	
B.S.A.	Canada	Canada	Canada	1) 9 2) 6	34 -	
B.Sc.	U.S.A.	U.S.A.	U.S.A.	1) 8 2) 3	30 -	
B.Sc.	Canada	Canada	Canada	1) 18 2) 2	49 -	
B.Sc.	Canada	Canada	Canada	1) 3 2) 4	25	
B.A.	The Netherlands	Canada	Canada	1) 11 2) 8	39 -	
B.Sc.	Canada	Canada	Canada	1) 2 2) 2	25 -	
B.A.	Canada	Canada	Canada	1) 8 mos. 2) 8 mos.	27 -	
B.S.A.	Canada	Canada	Canada	1) 10 2) 2	45 -	
B.A. (Hons)	Canada	Canada	Canada	1) 19 2) 20	51 -	
B.A.	Canada	Canada	Canada	1) 4 2) 4	26 -	bilingual
B.Sc.	Germany	Germany	Germany	1) 12 2) 1	46 -	bilingual
B.S.A.	Canada	Canada	Canada	1) 16 2) 15	40 -	
B.Sc.	Canada	Canada	Canada	1) 9 2) 1	34 -	
B.Sc.	Canada	Canada	U.S.A.	1) 3 2) 1	29 -	
B.A.	Canada	Canada	Canada	1) 4 2) 4	33 -	
B.Sc.F.	The Netherlands	The Netherlands	Canada	1) 14 2) 10	44 -	bilingual
B.Sc.	England	England	England	1) 20 2) 1	43 -	
B.Sc. (Hons)	Canada	Canada	Canada	1) 5 2) 2	30 -	bilingual
B.Sc.	Canada	Canada	Canada	1) 2 2) 1	24 -	
B.Sc.	Canada	Canada	U.S.A.	1) 17 2) 1	47 -	
M.Sc.	England	Canada	U.S.A.	1) 13 2) 2	41 -	
M.A.	Canada	Canada	Canada	1) 13 2) 13	41 -	
M.Sc.	Canada	Canada	Canada	1) 1 2) 1	29 -	

Degree Level	i	ii	iii	iv	v	vi
M.Sc.	S.W. Africa	Canada	Canada	1)1 2)1	27 -	
M.Sc.	Canada	Canada	Canada	1)3 2)1	29 -	
M.A.	Canada	Canada	U.S.A.	1)14 2)13	39 -	
M.Sc.	Canada	Canada	Canada	1)2 2)1	29 -	
M.Sc.	Germany	Canada	Canada	1)7 2)6	34	
M.A.	Canada	Canada	Canada	1)18 2)1	47	
M.S.A.	Canada	Canada	Canada	1)4mos 2)4mos	27 -	
M.S.	England	Canada	U.S.A.	1)2 2)3	32 -	
M.Sc.	Hungary	Hungary	Canada	1)3 2)3	36	
M.Sc.	Canada	Canada	U.S.A.	1)17 2)17	41 -	bilingual
M.S.	U.S.A.	U.S.A.	U.S.A.	1)20 2)7	50 -	
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)3 2)3	34	
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)11 2)2	34	
M.Sc.	Canada	Canada	Canada	1)3 2)6	27 -	bilingual
M.Sc.	Canada	Canada	Canada	1)4 2)3	29 -	
M.Sc.	Canada	Canada	Canada	1)6 2)14	43 -	bilingual
M.Sc.	Canada	Canada	Canada	1)2 2)2	25 -	
M.Sc.	England	England	Canada	1)12 2)1	38	bilingual
M.S.	Canada	Canada	U.S.A.	1)13 2)10	48	
M.Sc.	U.S.A.	Canada	U.S.A.	1)3 2)3	29 -	
M.S.A.	Canada	Canada	Canada	1)2 2)3	27	
M.Sc.	Canada	Canada	U.S.A.	1)15 2)3	47 -	
M.F.	Hungary	Hungary	Canada	1)3 2)3	30 -	

Special Committee

Degree Level	i	ii	iii	iv	v	vi
M.A.	Canada	Canada	Canada	1)17 2)17	41	
M.Sc.	Canada	Canada	Canada	1)1 2)1	25-	
M.A.	U.S.A.	U.S.A.	U.S.A.	1)2 2)1	31	
M.Sc.	Canada	U.S.A.	U.S.A.	1)5 2)2	39-	
M.Sc.	Canada	Canada	U.S.A.	1)12 2)9	41	
M.S.	Phillipine Islands	Phillipine Islands	U.S.A.	1)1 2)2	34	
M.Sc.	Canada	Canada	Canada	1)3 2)3	37-	bilingual
M.A.	Canada	Canada	Canada	1)18 2)3	55-	
M.Sc.	Canada	Canada	Canada	1)17 2)17	47	
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)2 2)2	26-	
M.A.	Canada	Canada	Canada	1)1 2)3	28-	
M.Sc.	Canada	Canada	Canada	1)2 2)2	29-	
M.A.	Canada	Canada	Canada	1)19 2)19	52-	bilingual
M.Sc.	Canada	Canada	Canada	1)3 2)3	31-	bilingual
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)2 2)2	27-	
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)15 2)7	40-	
Ph.D.	England	England	England	1)6 2)1	33-	bilingual
Ph.D.	U.S.A.	U.S.A.	Canada	1)1 2)11	43-	
Ph.D.	Canada	Canada	U.S.A.	1)6 2)3	31-	
Ph.D.	Canada	Canada	Canada	1)16 2)9	53-	bilingual
Ph.D.	Canada	Canada	Canada	1)1 2)3	40-	
Ph.D.	Canada	Canada	Canada	1)3 2)2	37	bilingual
Ph.D.	U.S.A.	U.S.A.	Canada	1)1 2)2	38-	
Ph.D.	Canada	Canada	Canada	1)3 2)19	42-	

Degree level	i	ii	iii	iv	v	vi
Ph.D.	Canada	Canada	Australia	1) 2 2) 20	43	
Ph.D.	Canada	Canada	Canada	1) 12 2) 20	45 -	
Ph.D.	Canada	Canada	U.S.A.	1) 8 2) 9	39	
Ph.D.	England	Canada	Canada	1) 2 2) 11	36	bilingual
Ph.D.	Canada	Canada	Canada	1) 5 2) 17	42 -	
Ph.D.	Canada	Canada	Canada	1) 3 2) 12	42 -	
Ph.D.	Canada	Canada	Finland	1) 6 2) 6	30 -	
Ph.D.	Canada	Canada	U.S.A.	1) few mos. 2) 7	35	
Ph.D.	Canada	Canada	Canada	1) 9 2) 10	39 -	
Ph.D.	U.S.A.	U.S.A.	U.S.A.	1) 1 2) 1	29 -	
Ph.D.	Canada	Canada	Canada	1) 16 2) 13	52	bilingual
Ph.D.	Canada	Canada	Canada	1) 13 2) 15	49 -	
Ph.D.	Canada	Canada	Canada	1) 3 2) 9	37 -	
Ph.D.	Canada	Canada	Canada	1) 8 2) 19	43 -	
Ph.D.	The Netherlands	The Netherlands	Canada	1) 1 2) 2	38 -	
Ph.D.	Canada	U.S.A.	U.S.A.	1) 10 2) 17	40 -	
Ph.D.	India	England	U.S.A.	1) 16 2) 7mos	51 -	
Ph.D.	Canada	Canada	Canada	1) 3 2) 19	57	
Ph.D.	Kenya	England	England	1) 1 2) 1	43 -	
Ph.D.	Canada	Canada	U.S.A.	1) 2 2) 3	31	

v - Average age - 37 years

vi - percentage able to operate efficiently in Canada's two official languages - 13.3%

N.B. In the case of M.A. & Ph.D. holders, the year from graduation refers to the time since last degree was obtained.

d)

Degree	1962	1963	1964	1965	1966	1967	1968
B.A.	4	4	4	5	8	7	10
B.S.A.	1	3	3	3	5	5	5
B.Sc.	1	1	1	5	4	15	15
D.V.M.	1	1	1	1	1	1	1
M.A.	6	6	4	7	6	8	8
M.S.	1	2	2	3	4	4	4
M.Sc.	7	7	8	16	23	28	28
Ph.D.	18	19	19	19	21	26	27
M.S.A.				2	1	2	2
M.F.					1	1	1
B.Sc.F.						1	1
B.Com.						1	1

Total estimates for years 1969-73 = 89 man years

Percentage of turnover of professional staff in the three degree categories for each of the years 1962 to 1967

Our records are not sufficiently complete to provide the percentage of turnover, however, the numbers of personnel separating in the years 1962 to 1967, are shown below by degrees

	1962	1963	1964	1965	1966	1967
Bachelor	no record	no record	1	2	1	1
Master	no record	no record		2	2	1
Doctorate	no record	no record	1	0	0	0

f) Percentage of current professional personnel who since graduation

- i) have been employed by industry at one time
7.8%
- ii) have been on the staff of universities
18.6%
- iii) provincial departments or agencies
35.2%
- iv) other federal agencies
8.8%

g) Number of staff in each degree category on educational leave

B.Sc. - 1

h) Number of university students given summer employment in the field of scientific activities for the years 1962 to 1967

1962	-	6
1963	-	6
1964	-	8
1965	-	11
1966	-	16
1967	-	18

2.6 Expenditures associated with scientific activities

(a) (\$000's)

	1962/63	63/64	64/65	65/66	66/67	67/68	68/69 (est.)
Intramural	596	741	748	923	1,461	1,824	2,678
Data Collection	255	317	366	564	627	767	687
Scientific Information	40	40	60	65	214	206	201
Support of Research	*	*	*	56	121	154	175
	980	1,098	1,174	1,608	2,423	2,951	3,741

*Separate data not available for these years. Included as part of intramural expenditures.

Capital	91	71	94	393	760	778	1,100
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(1) Intramural research and development

includes wildlife research (mammalogy),
migratory bird research, migratory bird
damage, pathology, pesticides, limnology.

(2) Data collection includes migratory birds

surveys and enforcement. Enforcement
expenditures are negligible (largely
salaries).

(3) Scientific information includes that portion

of the information activity related to
reports, monographs, plus a fraction (2/3?)
of salaries.

Special Committee

All under (2) natural sciences, and (b)
biological sciences except for three contracts
for economic studies.

(16) Other

Other wildlife conservation, outdoor recreation,
environmental quality.

(b) --

Expenditures - Operation and Maintenance

(\$ 000's)

	<u>1966-67</u>	<u>1967-68</u>	<u>1968-69</u>
Administration	639	767	734
Migratory Birds	561	1,089	1,851
Mammals	433	589	601
Pesticides	48	159	192
Pathology	102	58	80
Limnology	65	93	101
Interpretation		20	78
Information	214	206	201
	<u>2,062</u>	<u>2,981</u>	<u>3,838</u>

Expenditures - Capital

	<u>1966-67</u>	<u>1967-68</u>	<u>1968-69</u>
Administration	91	44	41
Migratory Birds	612	636	594
Mammals	35	56	42
Pesticides	3	4	2
Pathology	3	2	6
Limnology	16	19	10
Interpretation		17	405
Information	<u>760</u>	<u>778</u>	<u>1,100</u>

2.7 Research Policies

(a) (1) To answer this question it is necessary to distinguish between (a) activities that the Service carries on in the discharge of those responsibilities that fall exclusively within its purview, (i.e., all activities in support of migratory bird management), and (b) activities that are undertaken as a service to other units and agencies (e.g., research in support of wildlife management in the National Parks and Territories).

(a) Broad guidelines and priorities are set by the Directorate to govern the definition and selection of specific projects, which usually are the product of consultation between researchers and their immediate supervisors. Occasionally a specific project is assigned by the Directorate, but whether it is assigned by the Directorate or developed at the field level in response to the general statement of guidelines and priorities, the individual researcher has the responsibility for detailed project planning. It has been our policy to see that all researchers are aware of and appreciate broad guidelines and priorities, and as a result most projects are initiated by the researchers themselves. It is considered that better work is accomplished if the individual researchers feel that they have played a major role in project selection and development.

The Service has a project planning and reviewing routine which requires that projects be justified and described in terms of objectives. operational plans, dollar and personnel costs before they are begun. Project proposals as well as annual progress and completion reports are reviewed and approved by supervisors. The level at which new projects are approved depends upon the extent to which the project appears to conform with broad guidelines and priorities and is a matter for the judgment of the supervisors. Directorate staff specialists in each discipline review programs and projects on a more or less continuous basis. The project reporting routine is tied in with the preparation of estimates and procedures for personnel evaluation and salary recommendations.

- (b) The same system of project control is employed in respect of projects that are undertaken primarily as a service to other units and agencies, but project selection and initiation is influenced to varying degrees by the client unit. In most cases, the client outlines the management problem and the Service defines the research required to contribute to its solution. In the National Parks and Territories, where the Service's association with the management agencies is of long standing, Service researchers often anticipate or detect problems and recommend research projects required for their solution.

- (2) Priorities in research are established by judgment and are affected by recommendations at succeeding levels upward in the organization. Judgments are influenced primarily by short- and long-term operational requirements, and the availability of funds and personnel.

Priorities are implemented by direction to those concerned and, of course, by the allocation of funds and personnel.

- (3) Because most Canadian Wildlife Service research projects employ only a few people, network methods have not been used in their planning and undertaking. Simple network methods have been used in connection with the gathering of data on migratory bird harvest and the assembly of information required for the establishment of migratory bird hunting regulations. Along somewhat similar lines we have recently contracted for a study of the feasibility of developing a mathematical model of the interactions between migratory bird populations, habitat and hunters having in mind the possibility of using simulation techniques to evaluate various alternative research and management strategies.
- (4) All Canadian Wildlife Service research programs have a component of projects contracted out, and the amount of contracts has increased substantially in recent years. Details of contracts let for the years 1965-66 to 1967-68 are given in Exhibit E.

These include projects which stand by themselves (e.g., studies of Arctic-nesting geese - Dr. C. MacInnis, University of Western Ontario), and those which should be termed research support services (e.g., analysis of pesticide residues - Dr. D.J. Ecobichon, University of Guelph.)

- (5) Extramural research supported at universities (Canadian Wildlife Service does not support research in industry) by the Canadian Wildlife Service has a dual objective: to get needed work done and to facilitate the training of graduate students by providing opportunities that would not otherwise be available for part-time or term employment in wildlife research.

The Canadian Wildlife Service has awarded 16 scholarships a year the past two years, a modest increase from the initial awards of a few years ago. The awards are based on academic excellence, relevancy of research to the work of the Service and referee recommendations. The amount of the award is \$1,200 and is given to the student, not to his university.

- (6) This is really just another way of asking question 2.7 (a) 2) above and the answer is the same.
- (7) By the transmission of reports, memoranda and publications and by personal contact.
- (b) Not applicable.

2.8 Research Output

- (1) Not applicable.
- (2) Books or journal articles arising from research activities are listed in Exhibit F.
- (3) Reports issued from agency and units are listed in Exhibit G.
- (4) Frequent conferences are held or attended to transfer information, such as the Federal-Provincial Wildlife Conference, meetings of the Administrative Committee for Caribou Preservation, the National Committee on Wildlife Lands, several interdepartmental committees, and a number of international conferences and meetings.
- (5) We don't assume any particular responsibility for this function. We recognize its potential value but haven't the resources to undertake it.

On an ad hoc basis, data are sent to scientists working in related fields in other countries, particularly the United States.
- (6) There has been very little turn-over. Drs. W.A. Fuller, G. Moisan, L. Lemieux, are examples in the category cited above.

Dr. Fuller is Professor of Zoology, University of Alberta; Dr. Moisan, Professor of Biology, Laval University, and F.A.O. adviser in the Cameroun; Dr. Lemieux, former Director of Fish and Game and former Director, Quebec Provincial Parks, and now Canadian External Aid adviser to Tanzanian Government.
- (7) Research teams have developed in response to the need to solve major wildlife problems and include those engaged in barren-ground caribou research, studies of the ecology of western National Parks, prairie migratory birds and wildlife pathology.

- (8) The most significant facility is the construction of the Prairie Migratory Bird Research Centre, established on the campus of the University of Saskatchewan, Saskatoon, and officially opened June 1967. Apart from the significant contributions made to new knowledge, valuable processes in pathology and in aging, tagging and surveying animal populations have been developed. New statistical techniques have been developed to gather and better interpret wildlife parameters.
- (9) The Canadian Wildlife Service scientific activities contribute primarily to the enhancement of opportunities for outdoor recreation and to scientific knowledge. They have some impact on economic activity but it would be certainly difficult to measure.

Contributions to scientific knowledge have been primarily with respect to the life histories and ecological relationships of vertebrate animals. These have been substantial, and are internationally recognized, particularly with respect to a number of Arctic mammals and some species of ducks, geese and sea-birds. Citations of Canadian Wildlife Service publications in the publications of ecological theorists doing works of synthesis in the field bear this out.

In respect of outdoor recreation, it may be said that most Canadian Wildlife Service research is directly in support of managing some of the resources upon which outdoor recreation is based, and that all support it at least indirectly. The maintenance of huntable populations

of migratory game birds, of populations of large mammals in National Parks of a size that they are in harmony with their environment, and of optimum populations of wildlife in the Territories all depend on the information resulting from Canadian Wildlife Service researches. All those conditions have a demonstrable though at the moment immeasurable economic aspect. Hunting, fishing and tourism in National Parks generate economic activity, but the precise extent to which it can be attributed to supporting research cannot be quantified. Wildlife in the Territories has additional social and economic value related to the dependence of some of the inhabitants of the Territories on wild meat and fur. Again the relationship with supporting research cannot be quantified.

- (10) Dr. L.M. Tuck was awarded the Terrestrial Wildlife Publication award of the Wildlife Society for his monograph, "The Murres". He also received a honorary doctorate from Memorial Univeristy. Thirteen regular Ph.D.'s have been awarded our professional staff and a number of others have received their Master's degree. Dr. L.P.E. Choquette was awarded the St. Eloi Medal of the College of Veterinary Surgeons of the Province of Quebec in recognition of his scientific contribution. Several staff have been made Fellows of professional and scientific organizations.

2.9 (1) The publication "Canadian Wildlife Service '66" documents by discipline the projects undertaken between 1962 and 1966 inclusive. A copy of the publication is attached in exhibit H. There were a few changes in 1967, the most significant being the Wetlands Easement Program which became operational.

(2) Ornithology

(1) Program - Breeding Ecology, Taxonomy, Population Dynamics of Arctic Nesting Geese. This program began in 1952 and is continuing. It consisted of studies of the greater snow goose*, lesser snow goose*, blue goose*, Ross' goose*, white-fronted goose, Atlantic*, brant, black brant* and two races of Canada geese. This is a co-ordinated program which for each species listed above has moved from basic to applied to developmental research. For all species listed, the basic research has nearly been completed. The hard core of the 11 man team who attacked this problem was provided by three Canadian Wildlife Service Scientists and by five contractual scientists. A total of 8 Ph.D. theses will have resulted by 1969-70, as well as 80 publications. Major contributions in basic research have been in the areas of population genetics, mortality tables, environmental control of reproductive success, physiology of migration, nutrition. Applied Research - The main contributions have been in Development of Mass Capture Techniques which have resulted in nearly 200,000 birds being captured and banded, method of forecasting reproductive success in advance of hunting season. Development - Areas essential to the survival of the 6.5 million geese involved have been set aside as Federal Migratory Bird Sanctuaries. Indians have been encouraged to open tourist hunting camps in areas

* = completed

where goose populations were underharvested, because of basic research it has been possible to set harvest regulations which have resulted in the doubling of numbers of Ross', greater snow and one population of white fronted geese.

The techniques developed in banding, censusing and forecasting have now been applied in Alaska, Siberia, European Russia and Iceland.

	<u>Basic</u>	<u>Applied</u>	<u>Development</u>
Blue	*	*	*
L. Snow	*	*	*
G. Snow	*	*	
Ross'	*	*	*
W.F.	*	*	
Canada	*		
B. Brant	*	*	
A. Brant	*	*	

*Major portion completed

(ii) Whooping Crane - Basic Research in Conjunction with the United States Bureau of Sports Fisheries and Wildlife - Life History, Nutrition, Artificial Propagation, teratological effects of varying amounts of heat and oxygen applied to incubating eggs, disease.

Attempts are being made to create a captive flock of this rare and endangered species. Seventeen birds are now in captivity as a result of injury and 10 survivors of eggs taken from Wood Buffalo Park. Total world population in 1964 - 46, 1965 - 48, 1966 - 51, 1967 - 55, 1968 - 65. One major publication has resulted from this primarily operational project. Eventually it is hoped to release 100 birds per year into the wild.

(iii) Basic Research Mortality and Distribution of Mallard Ducklings, Kindersley Area, Saskatchewan. This fundamental study was concluded in 1966 and showed clearly the relationship between mortality and phenology of nesting. It was also shown that upon fledging ducklings made migrations northwest for distances of 350-500 miles. This has had an important bearing on regulations relating to the harvest of mallards in western Canada.

Land Acquisitions and Easements

(i) The Last Mountain Lake National Wildlife Area in Saskatchewan is located about half way between the cities of Regina and Saskatoon. It covers 20,800 acres and extends around the northern portion of Last Mountain Lake. Development and management of the wildlife area is a joint undertaking by the Canadian Wildlife Service and the Province of Saskatchewan. Over 13,000 acres of farmland and marsh have been purchased by the Wildlife Service and 7,000 acres of Crown lands have been contributed by the provincial government. A resident manager, employed by the Canadian Wildlife Service, is now preparing a long-term plan for multiple use of the area which will include sanctuary and feeding areas for migratory birds, public access and hunting areas, and controlled grazing of renewed pasture lands.

(ii) The Kootenay River Flats, near Creston, British Columbia, is the most important area for waterfowl between the Alberta boundary and coastal British Columbia. A co-operative program to protect and manage the flats for wildlife has been initiated by the Canadian Wildlife Service and the British Columbia Game Branch. Of the 15,000 acres involved, 12,000 acres belonging to the provincial Crown have been set

aside for wildlife and 3,000 acres, within Indian reservations, have been secured by a long-term lease. A resident manager, employed jointly by the co-operating agencies, is now preparing long-term development and management plans for the wildlife area.

(iii) The Sand Pond National Wildlife Area in Yarmouth County of Nova Scotia consists of fresh water marshes, lowland bogs and upland meadows. Located within a few miles of large coastal marshes the area provides an important alternate feeding and resting area for migratory waterfowl. In addition, the area supports good populations of woodcock, deer and upland game. Of the 1,300 acres included in the wildlife area, 237 acres of provincial Crown land were transferred to the Department of Indian Affairs and Northern Development and 1,263 acres were purchased by the Canadian Wildlife Service. In co-operation with the Nova Scotia Department of Lands and Forests, a development and management plan is being prepared.

Mammalogy

Completed projects were largely centred on specific animals which are either unique or have created problems in management. It is our rôle to provide the best information, based on research, to management agencies we advise. Significant projects are listed below:

- (i) Although we expect to be doing short-term investigations on particular problems arising from over-populations of elk in the Western National Parks the basic research necessary to understand the animal and its response to its environment is complete. The results have been published thus far in the form of a doctoral thesis.
- (ii) The white fox is an important fur-bearer, particularly in the Northwest Territories. The Northwest Territories Government has been concerned for some time about developing the best methods possible for the utilization of white fox populations. The study of some of these populations has been completed and the information obtained presented to the Government of the Northwest Territories for their action on the management proposals. The information obtained in the study was used for a doctoral thesis which was successfully presented.
- (iii) Muskoxen of the Northwest Territories are unique, long protected from hunting and located in isolated areas. Initially the study of muskox was carried out to learn as much as possible about the life-history of the animal and finally to determine the population dynamics and status of the animal throughout the Arctic. Both major studies have been completed and have resulted in the production of a doctoral thesis, numerous publications and a monograph of high quality.

Information on the management of muskox populations has been presented to the Northwest Territories Government in the form of management recommendations. (iv) A long-term research and management study of the bison in Wood Buffalo National Park has been completed. The research has been directed toward a study of population dynamics of the free roaming hybrid population and salvaging from the Park the extremely rare wood bison. Management studies have involved disease control.

The end result has been:

- (a) Population statistics for the bison in Wood Buffalo National Park have been established on an annual basis.
- (b) The wood bison has been transplanted as disease-free stock into other areas within its former range.
- (c) A program involving the complete eradication of named diseases in the bison of Wood Buffalo Park has been developed and approved.

The Canadian Wildlife Service will continue to advise the National and Historic Parks Branch as the management proposals obtained from our research are followed through. Numerous papers and reports have been published on our bison studies.

Limnology

Research is carried out on basic limnology, on fish ecology and on fishery management in order to advise the authorities with respect to the management of National Parks waters.

Completed phases of some projects have been submitted in the form of manuscript reports or published in scientific journals. Significant projects are:

(i) Limnology of Alpine lakes The management of high mountain lakes for game fish production presents numerous problems on species selection, and intensity of stocking programs. Data on primary production are essential to the development of a sound policy.

Reports have been submitted on the limnology of numerous lakes in Yoho, Banff and Jasper National Parks. Investigations include water quality, lake morphology and animal community composition, particularly of zooplankton.

(ii) Zooplankton dynamics in Alpine lakes Because of the relative simplicity of the zooplankton community in Alpine lakes, research is carried out on the distribution and the dynamics of the populations in terms of seasonal abundance, diurnal migrations and successional changes in the community. Results obtained in projects (i) and (ii) have been used for a doctoral thesis which was successfully presented.

(iii) Limnology of lakes in Terra Nova National Park

This project includes the study of chemical and biological characteristics of most of the park waters. A special emphasis is given to the study of brook trout. The primary production is study by the Carbon 14 method in selected lakes to evaluate the importance of lake morphometry on the lake productivity in terms of plankton, bottom fauna, brook trout

and other game fish. Field work is completed; results are being analysed and will be used for a doctoral thesis.

(iv) Atlantic Salmon Since one of the purposes of the National Parks is to preserve ecological habitats typical to given areas, it is also imperative to rehabilitate species of game fish such as Atlantic salmon in the National Parks when conditions permit. Such a run has reappeared in Fundy National Park. This population of salmon has been studied to determine its characteristics such as age, size and time of spawning.

(v) Genetics of Salmonids This is a co-operative project which involves several species of trout and their hybrids. The purpose of this study is to determine the effects of natural selection on the transmittance of genes controlling morphological characteristics and certain enzymes. The enzyme coding of natural populations has been determined particularly in Terra Nova National Park. Several papers have been published.

Special Committee

2.10 Organizations not currently engaged in
scientific activities

Not applicable.

2.5.c CHART I Canadian Wildlife Service

B.A.'s, M.A.'s, and Ph.D.'s employed in Canadian Wildlife Service Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

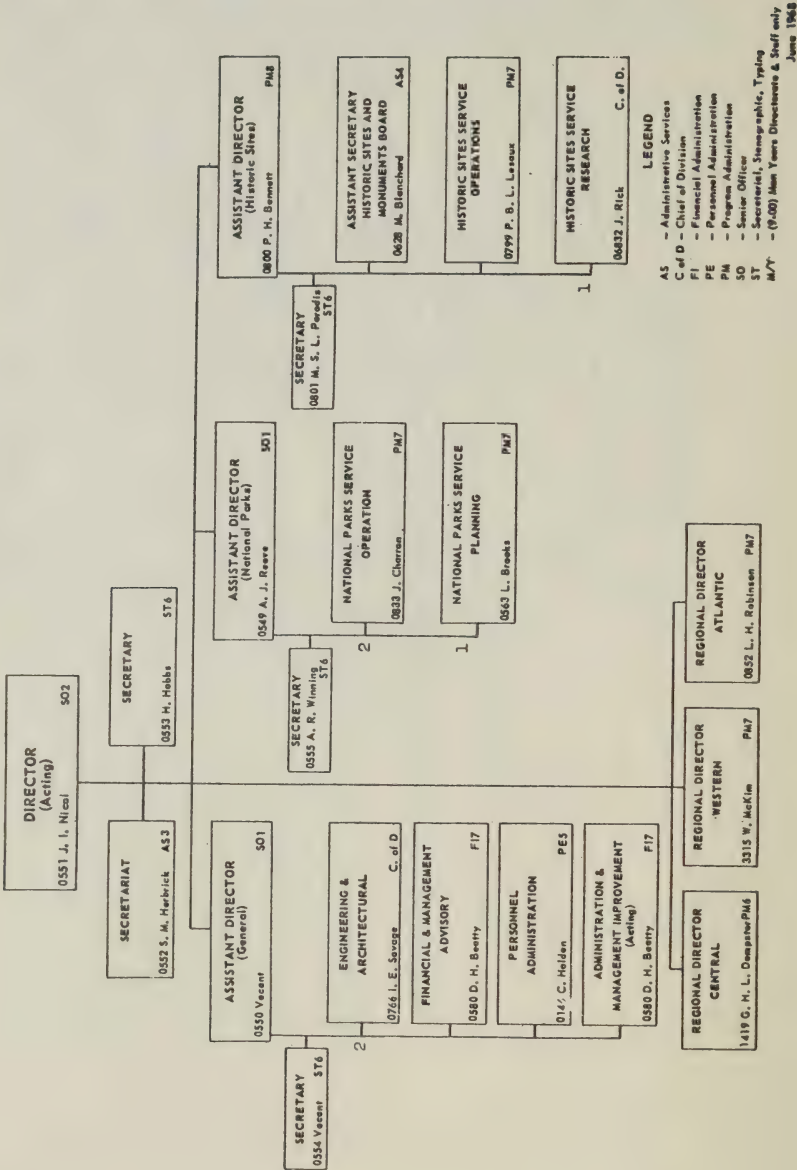
Country of Training	Country of Birth	B.A.				M.A.					Ph.D.								
		Canada	U.S.A.	Netherlands	Germany	England	Canada	England	S.W. Africa	Germany	Hungary	U.S.A.	Phillipine Is.	Canada	England	U.S.A.	Netherlands	India	Kenya
Secondary Schooling																			
Canada	23		1			25	2	1	1		1		20	1					
England					1		1							1				1	1
U.S.A.		1									7					3			
Germany				1															
Netherlands				1															
Hungary										2							1		
Phillipine Is												1							
B.A.																			
Canada	21			2															
U.S.A.	2	1																	
Germany				1															
England					1														
M.A.																			
Canada						20		1	1	2									
U.S.A.						6	3				8	1							
Ph.D.																			
Canada													13	1	2	1			
England														1				1	
U.S.A.															1				
Australia																	1		
Finland																			
Able to operate effectively in both languages	4	-	1	-	1	6	1	-	-	-	-	-	3	2	-	-	-	-	-

BRIEF
TO
SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
National and Historic Parks Branch
December 1968

2.1.c

National and Historic Parks Branch

NATIONAL & HISTORIC PARKS BRANCH
BRANCH ORGANIZATION CHART 1968-69



There are four main divisions within the Parks and Historic Sites Branch: Research Division, Planning Division, Interpretation Section, and Engineering and Architectural Division. Its main responsibility is in the rational planning for the preservation and utilization of a system of national parks and historic sites.

1. - Substantial Scientific Research
2. - Incidental Research

Introductory Note

The National and Historic Parks Branch, generally speaking, is not concerned with pure scientific research. Normally, any scientific activity is oriented towards improving operations and achieving Branch objectives.

There are four units within the Branch which do have a scientific or quasi-scientific function. To a greater or lesser extent. The Research Division of the National Historic Sites Service has a staff of historians and archaeologists whose job it is to supply the preliminary and continuing research necessary to the preservation and development of nationally important historic sites. The Planning Division of the National Parks Service uses scientific methods to study outdoor recreation demand and to determine, through the preparation of master plans, the best way to develop and use the unique natural areas which the Branch holds in trust for the Canadian people. The Interpretation Section of the National Parks Service Operations Division becomes involved in scientific fields such as biology, zoology and so on, although again it is not a research unit per se. Our Engineering and Architectural Division occasionally finds itself in a research role, as for instance during the restoration of historic buildings, or in the field of avalanche control.

It would have been difficult to combine a description of the activities of these units into one brief. This submission is therefore divided into four parts, as follows:

Research Division, National Historic Site Servicepage 1
Planning Division, National Parks Servicepage 35
Interpretation Section, National Parks Service Operationspage 58
Engineering and Architectural Divisionpage 64

In each case, the submissions follow the format and numbering set out in Part II of the Guideline for Submission of Briefs.

SUBMISSION BY THE NATIONAL HISTORIC SITES SERVICE,
RESEARCH DIVISION, TO THE SENATE SPECIAL COMMITTEE
ON SCIENCE POLICY

The following information is provided in accordance with the guidelines established by the Senate Special Committee on Research Policy to deal with the research work of the National Historic Sites Service (Research Division), National & Historic Parks Branch, Department of Indian Affairs and Northern Development. The numbering system and the topics covered are those set out in the above-mentioned guidelines.

2.2 ORGANIZATIONAL FUNCTIONS

2.2 (a) The Department is established under the Indian Affairs and Northern Development Act. The research of the National Historic Sites Service, however, stems indirectly from the Historic Sites and Monuments Board of Canada Act. This empowers the Minister to designate and acquire places of national historical significance and established the Historic Sites and Monuments Board of Canada to advise the Minister on matters of an historical nature. The first responsibility of the Research Division is to provide the Board with the data (historical, archaeological or architectural) necessary to enable the Board to evaluate the proposals placed before it and to advise the Minister thereon. Once an historic site has been acquired by the Department, the Research Division must supply the information which will permit the development (restoration, reconstruction, etc.) and interpretation of that site for the public. The Division is also responsible for providing advice to the National Park Service on the interpretation of historical places and events within the national park system.

2.2 (b) It is the policy of the National Historic Sites Service that all site development and interpretation be based on thorough research to ensure that restorations, exhibits, publications and all other forms of development and interpretation fully and accurately reflect the historical significance of the sites concerned and represent a wise exploitation of irreplaceable cultural resources. It is the responsibility of the Research Division to provide the professional Research support necessary to accomplish this.

2.2 (b) cont.

It is the policy of the Service that no one shall dig or alter the ground contours on any national historic park or site without the permission, in writing, of the Assistant Director (Historic Sites).

Such permission is granted (or refused) only after the request has been reviewed by the Research Division and, where necessary, the excavation is permitted only under the supervision of a professionally qualified archaeologist.

A similar policy is currently being drafted in regard to alterations and repairs to historic structures. Review of requests will be carried out by the Restoration Section of the Engineering and Architectural Division in conjunction with the Research Division. The purpose of this and the previously listed policy is to ensure that development activities and visitor use requirements do not result in the loss of irreplaceable archaeological and architectural information.

It is the policy of the Service that research activities must be "Applied" in that they must relate to the requirements of the Historic Sites and Monuments Board of Canada or to Departmental requirements for planning and/or development purposes. The relationship may be direct (as in the case of archaeological excavations at a national historic park) or indirect (e.g., excavation of a site outside the park system to provide comparative architectural data so as to permit reconstruction of similar structures inside the park). It is considered that "pure" research in the historical field is not the responsibility of this Service.

Ownership of all research financed by the Service is vested in the Crown which also has complete publication rights. No staff member or contractor may publish on Service-financed research without permission. It is, however, also policy that staff and contractors shall be actively encouraged and assisted to publish and that permission to publish shall not be withheld except for good reason.

Within the framework of available resources and development requirements, it is considered highly desirable that the "Applied" research of the Division should also constitute a contribution to knowledge.

2.2 (b) cont.

It is, therefore, the policy of the Service to encourage the formulation and resolution of research problems which satisfy both goals.

2.2 (c) The contacts with the organizations listed in the section are on the basis of co-operation rather than as a result of statutory functions or organizational policies. Roughly speaking this co-operation may be described as follows:

- (i) Archival material which is discovered in the course of research activities is contributed to the Public Archives of Canada. This would include such things as original documents which will form a lasting record for future researchers. In addition, there is frequent consultation with the National Museums of Canada particularly in the field of prehistoric archaeology. This permits the Research Division to obtain the advice of museum staff in an area where the Division is not justified in retaining specialized staff of its own.
- (ii) and (iii) With regard to both industry and educational institutions, the National Historic Sites Service is sometimes called upon to provide information and advice for these groups. Occasionally, the Division requests advice from a private organization on technical matters, e.g. from J. Wedgewood & Co. on the dating of pottery found in archaeological excavations. Research contracts are sometimes awarded to universities.
- (iv) Contacts with international organizations are primarily through the memberships of individual researchers in the organizations. Research staff are encouraged to play active roles in learned societies and, particularly in the case of archaeology, most of these are international in character. Monitoring is done only informally in the sense that staff members must keep abreast of developments in their particular areas of research.

2.2 (c) cont.

- (v) The Division is frequently called upon to supply information to members of the public, and local or regional historical groups. The research papers prepared for the Historic Sites and Monuments Board are generally in response to requests from such individuals or groups. Advice is given on request, primarily in the architectural field, to municipal and provincial agencies.

2.2 (d) The process whereby the operational effectiveness, duties and goals are reviewed and revised may be broken down into three separate areas: (i) Budgetary planning and review; (ii) internal control by senior officer review of managerial accomplishments through the process of the annual employee evaluation; and (iii) actual assessment of developments in the field of national historic sites and parks. This may be expanded as follows:

- (i) Each year the previous year's annual estimates are reviewed and recommendations are made for these funds which will be required for the effective operation of the Division for the following fiscal year. If projects have not been completed or in fact started, decisions must be made and justified regarding the inclusion of a request for the re-allotment of the same funds in the next fiscal year for these same programs. This results in reviews not only by the managers directly concerned in the operation but also control areas such as the Branch Financial and Management Adviser's Office.
- (ii) The current employee evaluation system operative in the Department calls for the setting of goals for each person involved in the operation of the Division. These goals are subsequently reviewed in the subsequent assessment to discuss actual accomplishments. While this is done on an individual basis, it reflects very directly on the over-all operation of the National Historic Sites Service as the goals of each individual are intrinsically linked with those of the other employees of the organization and in turn to the total goals of the Service.

2.2 (d) cont.

(iii) As with any operating organization, goals are set and commitments are made relating to the progress and anticipated on the various programs undertaken by the National Historic Sites Service, Research Division. The fact that the Minister is ultimately answerable for the progress of his department results in continuous review by senior management of at least the major programs and, through them, ultimately, the over-all operation of the Service.

2.2 (e) The Department and the National & Historic Parks Branch have carried out and implemented various studies, but none have been directly concerned with the Research Division. In point of fact, the Division has existed as a separate organizational entity for only a little over a year. It came into being as a result of management's examination of the historical programs and the consequent decision to create a separate division so as to give research a stronger voice in these programs.

2.2 (f) The broad function of the Service is the protection of that portion of Canada's historical heritage which is of national significance. Existing legislation seems adequate in that it permits the Department to acquire and protect places of national historic importance; the limiting factor here is money and staff rather than statutory authority. Sites which are not of national importance (or have not yet been so declared) would appear to fall within the purview of provincial antiquities acts. (It should be noted, however, that at least one provincial agency has argued that archaeology is a federal rather than a provincial responsibility under the BNA Act. This view does not seem to be widely held at the provincial level.) There remain two areas in which the federal government could act to preserve historic resources. These are the protection of underwater archaeological sites (currently covered only inadequately by Section VIII of the Canada Shipping Act) and the export of antiquities.

2.2 (g) The chief hindrance has been lack of trained staff and, to a lesser extent, money. Historical archaeology is a new, and highly specialized, field and qualified personnel are scarce. Moreover, our own expanding program has been paralleled by a growing demand for historical archaeologists in the U.S.A. and Great Britain; our inability to compete with U.S. salaries has restricted our access to the relatively few qualified persons available. The same applies in the area of architectural history. As a result, we have been forced to hire comparatively inexperienced researchers and, in effect, provide training through on-the-job experience. This has substantially reduced our output at a time when a number of new parks have been added to the system and increased productivity is vital.

In view of the above and of the relatively small size of the present research staff, our ability to absorb new personnel quickly is limited. Thus, the implementation of blanket "hiring freezes" has particularly harmful effects. (See also 2.9 (2)).

2.2 (h) Since the Research Division has only been in existence for about a year, it is premature to consider further organizational changes until we have had time to adequately evaluate the present structure.

The most likely change in basic orientation is an increased emphasis on Indian sites as a result of recent Historic Sites and Monuments Board recommendations. This will necessitate greater involvement in prehistoric archaeology and ethnology. It is likely that this research will be contracted out in its entirety to university staff. We do not feel that we are justified in building up staff expertise in an area in which the universities are already carrying out a substantial proportion of the research. (See also 2.7 (2) (4)).

2.3 PERSONNEL POLICIES

2.3 (a) As in any other professional area, the personal contacts are most essential in the locating and hiring of professional staff. This results from not only contacts made on a person-to-person basis but also through the various university departments in Canada, the United States and abroad, contacts at professional conferences and through previous areas of employment. Frequently, university students work with the National Historic Sites Service during the summer in the fields of both historical research and archaeology and managers within the Service are given the opportunity to assess the work of these students first-hand. This has often led to offers for permanent positions being made to these students once they have completed their university careers. There is of course in conclusion the usual formal system of advertising through the Public Service of Canada, the conducting of formal interviews and the recommendations made for hiring based on these interviews and assessments made by professors connected with these students.

2.3 (b) No. Whenever possible, we try to hire persons who have already proved their research ability either through previous research employment or academic research (e.g. thesis).

2.3 (c) There is an annual employee evaluation program set up within The Department which results in the assessment of each employee by his supervisor with a view to reviewing goals set the previous year, progress made toward developing those areas identified as in need of improvement, evaluating the training requirements of the individual and assessing for current or future reference the wishes of the employee for areas of future employment and the views of the supervisor as to the areas where the employee could make an effective contribution. The basic results of these evaluations are used in planning staff advancements including the choice of those researchers who have the capabilities and potential interest for moving into the research administration field.

2.3 (d) Job classification (and, hence, salary) is determined by the Bureau of Classification Revision. Generally, research managers are classified at a higher level than the research staff they supervise; however, it appears that the new Historical Research classification (not yet in effect) will permit exceptional researchers to reach the same levels of classification on the basis of research productivity alone. Thus, the acceptance of managerial responsibility will not, in a sense, be a promotion, but merely a change of duties which is reflected in a change in classification. Within the Division, managers are recruited from the research staff and any researcher who is interested (relatively few are) and shows administrative ability is eligible for consideration for appointment to managerial vacancies at the lowest (Assistant Section Head) level. It is not likely, however, that a more senior management post (Section Head or Division Chief) would be open to a researcher with no managerial experience; generally, the senior posts are filled from the junior management levels.

2.3 (e) The Department has already established an Educational Leave Policy through which employees can be granted leave to return to their university studies on leave without pay from their Public Service position. Dependent upon the work that they will be doing when they return to the educational institution, allowances equivalent to a portion of their current salary can be granted together with the payment of certain additional expenses such as tuition, travel for research purposes, research expenses and removal expenses to the university concerned. The allowances made are based on the relationship of the thesis work involved to the actual work of the employing agency. This means that the more value to an organization the results of this university work would be, the higher the allowances are apt to be. The above, of course, refers to a full-time return to university of the employee in question. In addition, the Department has expressed a willingness to accept half the cost of university or other extramural training courses that would be of value to both the employee and the

2.3 (e) Cont.

organization. In a professional field, there are few courses offered intramurally that would be of benefit to research staff. Should such courses be made available, every reasonable attempt is made, within the limits of the numbers of persons who can normally be accommodated on such courses, to make this training available to staff of the Division.

2.4 DISTRIBUTION OF ACTIVITIES

2.4 (a) Documentary research is concentrated in Ottawa because the Public Archives of Canada is the best repository of source material in the country. Archaeological excavations, naturally, take place on the site (the post-excavation analysis is carried out in Ottawa because of the facilities which the capital uniquely affords). Some architectural research must also be carried out on the actual buildings. Other things being equal, there are more archaeological sites (historic) and old buildings in eastern Canada than in the west and this has been reflected in the spending patterns to some extent.

2.4 (b) Historical research, per se, is not restricted by regional considerations. However, specific research topics may very well relate to a particular region. Thus, the archaeological investigation of, say, Acadian settlement patterns would necessarily be restricted to the Maritimes. On the other hand, the archaeology of fur trade posts would involve sites all across the country.

2.4 (c) The National Architectural Inventory has carried out pilot projects at Niagara-on-the-Lake, Kingston and Halifax and is currently recording historic buildings across the country. Archaeological excavations are carried out at sites across Canada. As was noted above, we doubt that this work can properly be regarded as "investigation of regional problems or phenomena". However, the following lists major archaeological excavations to date by province:

Newfoundland

Signal Hill National Historic Park	1965, 1966	contract
Castle Hill National Historic Park	1965, 1968	contract
L'Anse aux Meadows	1963, 1968	contract (in conjunction with provincial support)

Nova Scotia

Fortress of Louisbourg National Historic Park	1962 to present	staff and contract
Fort Anne National Historic Park.	1963	staff

2.4 (c) (Continued)

New Brunswick

Fort Beausejour National Historic Park	1962, 1966-68	staff
Fort Gaspereaux National Historic Park	1966	staff
Fort Meductic	1964	contract (in cooperation with N.B. Electric Power Commission)
Fort La Tour	1963	contract
Restigouche	1967	staff
La Coupe Drydock National Historic Site	1963	contract

Prince Edward Island

Fort Amherst National Historic Site	1963	staff
Roma Settlement	1968	contract

Quebec

Fort Lennox National Historic Park	1964-6	contract
Coteau du Lac National Historic Site	1965, 1966	staff
La Vieille Maison des Jésuites	1963, 1964	staff and contract
Cartier-Brebeuf National Historic Park	1959, 1962	staff and contract
Walker's Fleet	1965	contract

Ontario

Fort Malden National Historic Park	1966	staff
Dollier-Galinée National Historic Site	1966	staff
HMS Radcliffe	1966, 1967	staff
Fort St. Joseph National Historic Site	1963, 1964	contract
Rainy River Burial Mounds	1966	contract
Point Pelee National Park	1968	contract (in conjunction with National Parks Service)
Cahiagué	1966	contract (in conjunction with University of Toronto)

Manitoba

Lower Fort Garry National Historic Park	1965-8	contract
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Saskatchewan

Sturgeon Fort National Historic Site	1962	contract
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Alberta

Rocky Mountain House National Historic Site	1966	contract
Waterton Lakes National Park	1967, 1968	contract (in conjunction with National Parks Service)

British Columbia

Friendly Cove	1966	staff
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2.4 (d) The research activities of the Research Division of the National Historic Sites Service do not contribute directly to regional development. However, the work done forms a basis for the acquisition or development of national historic parks and sites across the country. Such work affects the regional economy through the use of local labour and materials (e.g., in excavation and reconstruction), increases in tourist traffic and the like. Thus it can be said that regional development is a result of the work of this agency but not a role as such.

2.4. (e) Since our work is related to the development and interpretation of physical sites throughout the country, non-distribution of research activities is an impossibility; and costs are therefore the total costs to the government of the Research Division. As indicated in 2.4. (d), regional development is not a role nor is it a primary objective of the research. The parks and sites developments -- interpretive displays, restorations and reconstructions -- which require research input do, of course, have a decided effect on regional development since they provide employment for the local work force and foster tourism.

It should be noted that archaeological excavations offer a means of temporarily alleviating unemployment in the areas of sites. The excavation utilizes a good deal of unskilled labour, provides summer jobs for university students (as "line" supervisors), does not compete with local industry, makes a contribution to knowledge, and may result in a potential tourist site. There are a number of potential drawbacks which mitigate against indiscriminate use of archaeology to relieve regional unemployment, but, applied judiciously, the scheme is feasible. Any archaeological work to be undertaken in this way should, however, conform wherever possible with already established priorities of the National Historic Sites Service in order to ensure the best use of federal resources.

2.5 PERSONNEL ASSOCIATED WITH SCIENTIFIC ACTIVITIES

2.5 (a) The following totals include both the staff at the Research Division in Ottawa and the research staff involved with the Fortress of Louisbourg National Historic Park restoration project at Louisbourg, Nova Scotia. (It should be noted that this project is the only one of its kind in the current National Historic Parks system in that, because of its size, it has its own research staff.) The staff listed as permanent below fill regular Public Service positions on a full-time basis.

It is extremely difficult to estimate the man-year content of research contracts. University contracts generally require the university to employ sub-contractors (i.e., university staff and students) and we have no record of these since we normally evaluate performance on the basis of the finished report. The contracts shown below are only those who are on contract at present and who are devoting more-or-less full time to carrying out the contract work.

	<u>Permanent Staff</u>	<u>Casual Appointments</u>	<u>Contractors</u>
<u>Administration</u>			
professional	1	0	0
administrative and clerical	3	0	0
<u>Historical Research</u>			
professional	14	0	4
support staff	1	0	0
<u>Archaeological Research</u>			
professional	8	2	10
technical support	4	1	16
<u>National Architectural Inventory</u>			
professional	2	0	0
support	0	0	2
<u>Fortress of Louisbourg National Historic Park</u>			
professional - history	1	0	7
professional - archaeology	2	0	1
support staff	1	Prev. rate labour	0

2.5 (b) A total of ten of the above professional personnel are involved in largely administrative duties -- six in Ottawa and four at Louisbourg.

2.5 (d) Since 1962, there has been one permanent professional staff member at the B.A. level working in the field of historical architectural research. One additional staff member (B.A.) was added in 1968. The following tables will give the same information for the fields of historical research and archaeology. Contractors are not shown for the reasons stated above. Louisbourg staff is included for previous years.

HISTORICAL RESEARCH

	<u>H.A. Honours</u>	<u>M.A.</u>	<u>Ph.D. or near Ph.D.</u>
1962	1	2	
1963	2	2	
1964	2	3	
1965	2	3	
1966	2	3	
1967	3	4	2
1968	7	3	3

ARCHAEOLOGICAL RESEARCH

1962		1	
1963		1	
1964		1	
1965		2	
1966	2	4	
1967	2	4	
1968	5	3	1

No positions have been included in estimates for 1969-70 because of the hiring restrictions. Beyond this period, staff requirements will depend on the size of the development program for which research is required. If the present 5-year forecast is carried out, a minimum of 25 professional positions in 1970-71 and 5 per year thereafter will be required to meet the demands of the program. 20 of the first 25 should be M.A. or at least Honours B.A.; for the remainder, Ph.Ds would be preferred, but we may well have to settle for M.As or even B.As. This will depend on the salary scale and job market at the time.

2.5 (e) There has been no turnover in the architectural research field during the time period specified. One person at the B.A. level was lost to the Archaeology field in 1966. The following charts will provide this information for the historical research field:

HISTORICAL RESEARCH

	<u>B.A. Honours</u>	<u>M.A.</u>	<u>Ph.D. or near Ph.D.</u>
1962	no turnover	no turnover	n/a
1963	no turnover	no turnover	n/a
1964	no turnover	lost 1-33 1/3%	n/a
1965	no turnover	lost 1-33 1/3%	n/a
1966	no turnover	lost 1-33 1/3%	n/a
1967	no turnover	no turnover	n/a
1968	no turnover	lost 1-25%	lost 1-33 1/3%

2.5 (g) There have been two members of the Research Division granted educational leave during this time, one a research historian, the other an archaeologist. Both have M.A.'s and have returned to university to obtain their doctorates.

2.5 (h)	<u>Historical Research</u>	<u>Archaeology</u>	<u>Louisbourg</u>
1962	5	2	6
1963	5	18	11
1964	5	25	9
1965	5	32	10
1966	8	30	60
1967	15	7	63

The above figures are only approximate. Some students are hired as prevailing rate labourers but our records are not arranged so as to readily know which labourers are students and which are not. Many students are employed by universities working under contracts with us, but we have no record of the number.

2.6 EXPENDITURES ASSOCIATED WITH SCIENTIFIC ACTIVITIES

2.6 (a) The Research Division of the National Historic Sites Service

has been set up in its present form for only a little more than a year. For that reason it is not possible to break down expenditures into the areas designated in the guidelines for this question. It can however be said that the work of the Research Division can be outlined as follows:

- | | |
|------------------------|---------------------------------------|
| Functions: | 1. Intramural R & D |
| | 2. Data Collection |
| | 3. Scientific information |
| Scientific Discipline: | 3. Social Sciences |
| | (a) anthropology (archaeology) |
| | 4. Historical Research |
| Areas of Application: | 5. Construction |
| | 12. Regional Development |
| | 14. Education techniques and policies |
| | 16. Other - Publications |
| | - Conservation |

2.6 (b) As indicated above, because of the recent establishment of the Research Division, it is not possible to itemize expenditures that would relate specifically to research. However the following table will outline expenditures during the period requested for the National Historic Sites Service in Ottawa (i.e., that area which controls the research activities) and the total Louisbourg Project. Note that these figures include administration, interpretation and other non-research activities.

YEAR	OTTAWA		LOUISBOURG	
	O&M	CAPITAL	O&M	CAPITAL
	\$	\$	\$	\$
1962-63	607,504	998,945	107,394	1,593,658
1963-64	651,780	705,834	170,150	1,554,096
1964-65(First year of Regionalization)	191,000	321,260	244,456	1,429,899
1965-66*	415,187	408,233	233,128	1,495,951
1966-67**	424,851	687,614	457,153	1,739,567

* A further breakdown is available for this fiscal year in the following areas:

OTTAWA-CAPITAL:	Archaeology and	
	Historical Research	\$209,714
	Architectural Inventory	\$ 22,945

2.6 (b) Cont.

** A further breakdown is available for this fiscal year in the following areas:

OTTAWA-CAPITAL:	Archaeology	\$306,416
	Historical Research	\$ 8,503
	Architectural Inventory	\$ 13,305

The following estimates are available for the Research Division, National Historic Sites Service, for the 1968-69 fiscal year:
(This is for the Ottawa operation only.)

<u>Area</u>	<u>O&M</u> \$	<u>CAPITAL</u> \$
Historical Research	78,300	25,000
Architectural Inventory	10,500	40,000
Archaeology	<u>58,400</u>	<u>272,000</u>
	<u>147,200</u>	<u>337,000</u>

For Louisbourg, the capital research budget for 1968-9 is as follows:

Historical Research	\$ 78,000
Archaeological Research	<u>\$ 174,000</u>
Total	<u>\$ 252,000</u>

2.6 (c) Education leave costs for the period under consideration are as follows:

1962-63	NIL
1963-64	NIL
1964-65	NIL
1965-66	NIL
1966-67	NIL
1967-68	\$3,900
1968-69	\$15,300

2.7 RESEARCH POLICIES

2.7 (a) (1) The bulk of research programs and projects are initiated by either (i) the Historic Sites and Monuments Board of Canada, or (ii) departmental senior management, or (iii) the Research Division itself.

In the case of (i), the Board requests research on a topic which it has been asked to consider; that is to say, a member of the public, a local historical society, etc. will have requested the Board to consider a particular person, place or event for national commemoration. The research is required to provide the information on which the Board will base its decision.

In the case of (ii), which accounts for most of the research output, the impetus is a departmental decision to develop an existing national historic park or site. The "problem" is not stated in scientific terms and goal-orientation is simply development of the site in terms meaningful to the visitor. The research input involves finding out as much as possible about the history, archaeology and architecture of the whole site or various aspects thereof so that this information can be used in planning and development. The research themes pursued are, however, broader than the above statement may seem to imply. For example, it is not possible to consider the Motherwell Homestead (a new park in Saskatchewan) without taking into account the broad picture of agrarian politics and Canadian contributions to agricultural research. None the less, the research is very definitely "applied" and originates in non-research considerations.

The Research Division must re-state managerial instructions in terms of problems susceptible to solution by research. This sometimes necessitates the creation of other programs designed to solve questions raised by the primary research. For example, operational requirements dictated the archaeological excavation of a number of 18th century French forts: Louisbourg, Gaspereau and Beausejour. Very little is known about the artifacts of this period, yet these must be analysed because the information is needed to interpret stratigraphic and architectural sequences which

2.7 (a) (1)-Cont.

in turn are vital to site development. Thus, it was necessary to initiate an artifact research program to solve these, and other, problems. Such "secondary" research is applied in that the results are ultimately used in park development, but the goals are defined by research needs rather than operational requirements.

Because of the pressures for immediate application, research programs are not primarily geared to broad research-oriented themes. However, such possibilities are kept in mind as a long-range ideal. Thus, the Service has excavated three fur trade sites and carried out various documentary studies relating to the fur trade. Some of these individual pieces of research are, in themselves, contributions to knowledge; others are more restricted in scope and of use primarily as "in-house" reports. The work of other agencies (provincial and university) on fur-trade sites is kept under review and at some time in the future a sufficient number of "pieces" will have been accumulated to permit a synthesis and, perhaps, a definitive statement of the role of the fur trade in Canadian history. Whether this statement is made by the Service, or by outside researchers using our material is irrelevant. The point is that, broadly speaking, most of the research of the Service can be viewed as components of long-term research-oriented goals. Operational demands do not permit us to approach these goals in the most logical or efficient (from a research point of view) manner, but it is not properly the role of the Service to do this. Ideally, we strive for programs which will result in park development and a contribution to knowledge, but, to some extent, the former task must have priority. Obviously, there is some danger development considerations will be given too much weight, with the result that a major expenditure on research will be channelled into avenues which do not produce results usable by the research community at large. So far this has not been the case, and the recent creation of the Research Division (which gives researchers a much greater voice in planning and policy) would indicate that senior management has seen the potential problem and acted to circumvent it.

2.7 (a) (1) Cont.

The only other federal agency involved in this process is the National Park Service. That Service would assign its own priorities to research and allocate sufficient funds. The Research Division of the National Historic Sites Service would assist in a chiefly advisory capacity -- by defining research problems, obtaining qualified contractors, reviewing reports, etc.

2.7 (a) (2) Priorities for development (which dictate research priorities)

are based on a number of considerations. For example, the preponderance of military sites now in the existing park system makes it desirable to concentrate new acquisitions in non-military fields. An emphasis over the past few years on sites in the Maritimes is now to be balanced by development in the west. The absence of a major national historic park in Alberta and Prince Edward Island suggests that high priority be given to these two areas, just as priority was recently given to developing parks in Newfoundland. Special events - such as the tricentenary of the Hudson's Bay Company - suggest related development of parks relating to this theme. Sites in proximity to population centres would be given preference over isolated sites. These and many other factors would be weighted in allocating available resources to development and research.

2.7 (a) (3) These techniques are used by the Department for major park development projects, especially those involving construction.

They are not used by the Research Division and, because of the nature of the work, do not seem applicable.

2.7 (a) (4) Extensive use has been made of contracts; the results have not been entirely satisfactory.

The current orientation among academic historians does not dispose them towards an interest in, or understanding of, the applied documentary research which we require. Best results have been obtained where contractors work closely with staff in our Ottawa office where the necessary direction can be supplied.

2.7 (a) (4) Cont.

In the field of archaeology, we have awarded contracts both to individuals and institutions. The former do not usually have the resources (laboratory space, reference works, etc.) to adequately handle the post-excavation analysis and we have swung to a system under which the contractors carry out this analysis using the support staff and facilities of the Service in Ottawa. In the case of institutions, the problem has been the relative isolation of the principal investigator who is usually the only person at the institution dealing in historic archaeology. We have frequently had to send staff specialists to assist contractors in various specialized aspects of the work. Generally speaking, our contractors have produced good work, but, in retrospect, the same expenditure would have produced better results had it been concentrated directly in one organization large enough to have the necessary specialists, collections, library, etc.

Contracts have been used extensively for the recording work of the National Architectural Inventory and this is continuing. The results will improve, however, when we have sufficient staff to provide contractors with more direction and better monitoring of program and results.

A problem with some individual contractors has been the fact that they also hold university appointments and the requirements of such positions, naturally, take precedence over our contract requirements. This has led to lengthy delays in the preparation of reports with serious consequences for development scheduling.

In summary, we feel that the bulk of our historical and archaeological work is highly specialized in areas peripheral to academic interest. University staff and individual contractors may not be experienced in these areas and, particularly with historic archaeology, lack the necessary support staff and facilities. It is our view that this work should be done by staff (or by individual contractors working closely with staff) for maximum utilization of resources. Prehistoric archaeology, however, should be contracted out to universities which have the specialized staff and facilities; we see no merit in building up staff expertise in this area

2.7 (a) (4) Cont.

in direct competition with the universities. Contracts for architectural recording have been more-or-less satisfactory and we plan to continue this work under contract.

2.7 (a) (5) Generally speaking we provide funds only for work directly applicable to our needs. We regard such finding as a contract calling for the production by the contractor of specific goods and services by specified dates; we do not consider it our responsibility to finance "pure" research or to provide grants.

2.7 (a) (6) Changes in research priorities are generally the result of changes in development priorities; such changes are not occasioned by technical developments. On small projects, the change is made simply by reassigning staff to new research topics. On large projects with substantial investment, an attempt is made to bring the project to some logical (and preferably publishable) conclusion so as to protect the investment and make it easier to pick up the threads if work can resume at a later date. There have been many small project changes, but few on large projects. The chief problem is staff morale which is adversely affected by frequent changes and sudden cancellations.

2.7 (a) (7) The transfer is primarily through papers presented at conferences and through publication. The Department has started a new scientific series as an outlet for staff and contract work and the first two issues are now in press.

2.8 RESEARCH OUTPUT

2.8 (2)

COLEMAN, MARGARET

The Roma Settlement at Brudenell Point, Prince Edward Island.

Accepted for publication in Historic Sites.

DIUBALDO, RICHARD J.

1968 Wrangling over Wrangel Island. Canadian Historical Review,
Winter.

FOLAN, WILLIAM J.

1966 A Note on Pre-Columbian Structures in Mani, Yucatan, Mexico.
American Antiquity, vol. 31, no. 5, part 1.1967 Don- and Donship Terminology in Merida, Yucatan, Mexico.
America Indigena, vol. XXVII, no. 1.A Note on Race, Class and Status in Merida, Yucatan, Mexico.
Anthropologica, vol. IX, no. 1.1968 El Chichan Chob y la Casa del Venado, Chichen Itza, Yucatan.
Annles, 1966, vol. XIX.The Open Chapel of Dzibilchaltun, Yucatan, Mexico. Accepted
for publication by Tulane University.Las Ruinas del Rancho San Pablo, Becanchen. Accepted for
publication by the Instituto Nacional de Antropologia e Historia.El Laboratorio Arqueologico del Instituto Nacional de
Antropologia e Historia en Merida, Yucatan. Accepted for
publication by the Instituto Nacional de Antropologia e Historia.
Kukulcan and a Phallic Cult in Chichen Itza, Yucatan, Mexico.
Accepted for publication by the Universidad Nacional Autonoma
de Mexico.A Unipod Water Bottle from Central Yucatan, Mexico. Accepted
for publication by the Universidad Nacional Autonoma de Mexico.

_____, P.J. AISH and J.T. DEWHIRST

Dry-cleaning Tags in the Archaeological Laboratory. Accepted
for publication in American Antiquity.

_____, JOHN H. RICK and WALTER ZACHARCHUK

1968 The Mechanization of Artifact Processing. American Antiquity,
vol. 33, no. 1.

_____, (and PHIL C. WEIGAND)

1968 Fictive Widowhood in Rural and Urban Mexico. Anthropologica,
vol. X, no. 1.

2.8 (2) (Continued)

FRY, BRUCE W.

A 'Rescue Excavation' at the Princess Half-Bastion, Fortress of Louisbourg. Accepted for publication in Historic Sites.

INGRAM, GEORGE

1965 Laura Secord Revisited. Ontario History.

LARRABEE, EDWARD McM.

1964 Industrial Archaeology in Great Britain. The Florida Anthropologist, vol. XVII, no. 2.

Archaeological Research at the Fortress of Louisbourg,

1961-5. Accepted for publication in Historic Sites.

LEE, DAVID

The Seige of Ile-aux-Noix. Accepted for publication in Vermont History.

MARWITT, RENEE H.

1967 Punch Card Design for Ceramic Analysis. The Conference on Historic Site Archaeology Papers 1965-1966.

A Preliminary Survey of Seven Coarse Earthenwares from the Fortress of Louisbourg. The Conference on Historic Site Archaeology Papers 1965-1966.

RICHARDSON, A.J.H.

An Early Settler on the Ottawa (offprint from Canadian Historical Review)

1963 The Old City of Quebec and our Heritage in Architecture (offprint from Canadian Historical Association Report)

1966 Architectural Guide and Period Walking Tours of the Old City of Quebec, prepared for Society of Architectural Historians (co-authored with Alan Gowans).

1968 Architectural and Town-planning Historical Tour of Quebec.

Prepared for Canadian Council on Urban and Regional Research.

2.8 (2) (Continued)

RICK, JOHN H.

Archaeological Investigations of the National Historic Sites Service, 1962-1966. Accepted for publication in Historic Sites.

Review of the 'Excavation of Fort Pic, Ontario'. Accepted for publication in Historical Archaeology.

Archaeological Excavations at Cartier-Brebeuf Park, 1962.

Accepted for publication in Historic Sites.

_____, and WALTER ZACHARCHUK

The Mallorytown Wreck. Accepted for publication in the Proceedings of the Third International Conference on Underwater Archaeology.

SCHUYLER, ROBERT L.

1968 The Use of Historic Analogs in Archaeology. American Antiquity, vol. 33, no. 3.

SUTERMEISTER, HELEN

The Engineer's House at Louisbourg. Accepted for publication in Post-Medieval Archaeology.

SWANNACK, JERVIS D., JR. (Arthur H. Robin and)

1965 Mummy Lake Gray: A New Pottery Type. American Antiquity, vol. 31, no. 2, part 2.

WALKER, IAIN C.

1962 [Note on a Bronze Spearhead from Banff] Discovery and Excavation Scotland 1962.

[Note on a Beaker from Nairn] Discovery and Excavation Scotland 1962.

1963 [A Halberd from Nairnshire] Discovery and Excavation Scotland 1963.

1964 An Unpublished Beaker from Nairnshire. Proceedings of the Society of Antiquaries of Scotland, Vol. XCV (1961-2).

Two Decorated Axes from the Larch of Moray. Proceedings of the Society of Antiquaries of Scotland, Vol. XCV (1962-3).

WALKER, IAIN C.

1965 The Clava Cairns. Proceedings of the Society of Antiquaries of Scotland, Vol. XCVI (1962-3).

Some thoughts on the Harrington and Binford Systems for Statistically Dating Clay Pipes. Quarterly Bulletin of the Archaeological Society of Virginia, Vol. 20, No. 2.

1966 TD Pipes -A preliminary Study. Quarterly Bulletin of the Archeological Society of Virginia, vol. 20, no. 4.

TD Pipes - A Preliminary Study, op. cit., vol. 20, no. 4.
Clay Pipes at Louisbourg. Eastern States Archeological Federation Bulletin No. 25.

A Pipemaker's Mark from Gouda, The Netherlands - Then and Now. American Antiquity, vol. 31, no. 5, part 1.

Dating from Modern Bottles. El Palacio, vol. 73, no. 3.

1967 The Laigh of Moray in the Second Millenium B.C., part I - Beakers, Food Vessels, and Cinerary Urns. Proceedings of The Society of Antiquaries of Scotland, vol. XCVIII (1964-5).

Clay Pipes from the Fortress of Louisbourg. Conference on Historic Site Archaeology Papers 1965-1966.

Statistical Methods for Dating Clay Pipe Fragments. Post-Medieval Archaeology, vol. I.

Historic Archaeology - Methods and Principles. Historical Archaeology.

Excavating by Backhoe. Ontario Archaeology, No. 10.

Clay Pipes from Casemate R10-15, King's Bastion, Fortress of Louisbourg. Accepted for publication in Historic Sites.

Clay Pipes from Casemate RI, King's Bastion. Accepted for publication in Historic Sites.

Easterton of Roseisle: A Forgotten Site in Moray. Accepted for publication in Studies in Ancient Europe.

WALKER, IAIN C.

The Laigh of Mcray in the Bronze Age: Part II-the Bronzes.

Accepted for publication in Proceedings of the Society of Antiquaries of Scotland.

Three Beakers from the Cawdor Area, Nairnshire. Accepted for publication in Proceedings of the Society of Antiquaries of Scotland.

Bronze Age Material from the Enzie. Accepted for publication in the Proceedings of the Society of Antiquaries of Scotland.

Some Thoughts on Theory and Method in Historical Archaeology. Accepted for publication in the Conference on Historic Site Archaeology Papers 1967.

Review of 'The Trail of the Iroquois Indians'. Accepted for publication in Post-Medieval Archaeology.

Review of 'English Clay Tobacco Pipes'. Accepted for publication in Industrial Archaeology.

_____, and L. de S. WALKER

McDougall's Clay Pipe Factory, Glasgow. Accepted for publication in Industrial Archaeology.

2.8 (3) Some three hundred reports have been produced in the last seven years for the Historic Sites and Monuments Board of Canada and for departmental use. These are not usually distributed outside the Department. It is our intention to publish as many of these as warrant such treatment as fast as our resources permit. This will eliminate the vexing problem of requests from outside researchers for unpublished staff material to be incorporated in someone else's publication.

2.8 (4) Staff attend a number of conferences such as the annual meetings of the Canadian Historical Association, American Anthropological Association, Society for American Archaeology, Society for Historical Archaeology, Society of Architectural Historians. Papers have been presented at a number of these and it is the policy of the Division to encourage presentation.

2.8 (5) Not applicable.

2.8 (6) A number of students who have received initial or substantial research experience with the Service are now completing Ph.D. studies or have received their doctorates and are professionally employed. The Service has not been carrying out research long enough for even the initial groups of students to have made "substantial contributions".

2.8 (7) The Research Division has three units which are unique in Canadian historical research. The underwater research unit is carrying out the excavation of historic period shipwrecks in a manner which compares favourably with similar work done elsewhere in the world; the only other Canadian professional group in this general field is the Royal Ontario Museum which concentrates on fur trade material and has not become involved in wrecks. The artifact research unit has been recently formed and clearly has the potential for

international leadership in research on historic period artifacts; there are other agencies with greater knowledge of specific artifact areas, but none which are pursuing the problems on such a broad front. Moreover, the artifact research program is backed by major archaeological excavations which (particularly in the underwater field) is a vital source of datable material for analysis. The technical research unit, also recently formed, has concentrated primarily on the applications of electronic surveying to archaeology. The principal work in this field is carried out at the Universities of Pennsylvania and Oxford, but, to our knowledge, ours is the only continuing program of investigations in Canada. We are fortunate in having a large excavation program which provides facilities for testing and evaluating the various techniques and devices. We do not intend to compete with larger organizations in developing new devices or exploring theoretical implications; rather, we propose to explore the applications of such work to our own problems which by extension, should relate to other archaeological sites.

In archaeological research generally, we have concentrated on the techniques and methodology of large-scale excavation best suited to our particular sites. Such methodology is not entirely relevant to prehistoric excavations in Canada and relates more to the methods employed in Central America and the Near East. For the past six years, we have offered a summer training program in field methods to Canadian university students which is the only source of training in large-scale excavation of masonry sites available in Canada. The number of applications received suggests that this program fills a very real need.

Potentially, the National Architectural Inventory of Canada can be the primary focus of research in Canadian architectural history. This potential has not yet been realized because of severe staff shortages -- the result of a general shortage of trained personnel plus unrealistic salary scales.

2.8 (8) We are concentrating on building up the Departmental library in the areas of historic archaeology and artifact research.

These are areas not adequately handled by other Canadian libraries.

The potential of the National Architectural Inventory has been noted in 2.8 (7) above. The artifact collections of the Service are of immense value for artifact research, but staff and space shortages have prevented us from making this material readily available to outside researchers; there seems little likelihood of improvement in the near future. We have developed a number of systems and procedures of general applicability to large excavation and artifact processing.

2.9 (9) The Research Division has been in existence for only a year and publication of our massive research backlog has only

just begun. It is, therefore, premature to discuss general impact.

In view of the comments of outside researchers familiar with our work it is likely that the chief impact will be in the areas of: architectural history, excavation and architectural recording techniques, underwater archaeology and naval architecture and artifact research.

2.9 PROJECTS

2.9 (1) The major archaeological projects have been listed above under section 2.4. Examples of historical research projects are:

- (a) research on Sir John A. MacDonald, the Bellevue House and 19th century furnishings in connection with the restoration and furnishing of Bellevue National Historic Park in 1967.
- (b) Written histories of the following National Historic Parks and Sites:

- 1. Battleford Post (1966)
- 2. Grand Pré (1968)
- 3. Fort Chambly (1966)
- 4. Fort Lennox (1965)
- 5. Fort Beausejour (1967)
- 6. Signal Hill (1965)
- 7. York Redoubt (1965)
- 8. St. Andrews Blockhouse (1966)
- 9. Lower Fort Garry (1966 - present)

- (c) Research report for restoration and interpretation of the Factor's House at Lower Fort Garry, Manitoba (1968)
- (d) Research reports on growth, nature and distribution of Acadian settlements in Maritime Province. Programme commenced in 1966, continuing in conjunction with archaeological research.
- (e) About 200 documented research reports prepared on various aspects of Canadian history for use of Historic Sites and Monuments Board of Canada.

In the architectural field we have carried out the following studies (in addition to the actual recording of old buildings):

- (i) Pilot Studies of Architectural Types in three selected regions in Canada (Halifax, Quebec City and Niagara-on-the-Lake, 1962-63) as part of program to establish criteria for selection of outstanding or typical examples of Canadian architecture, for use of proposed Inventory of Old Buildings in Canada.

2.9 (1) Cont.

(ii) The Development of Suburban Villas in Canada (1967).

Program to determine evolution of architectural styles in Canada, and secondarily to provide selection criteria for Historic Sites and Monuments Board of Canada.

2.9 (2) After basic research reports have been completed for a development program, there is still a continuing need for research input and assistance. In this sense, research is not completed until development is finished and, by this standard, no major research project has yet been completed.

Fort Beausejour may be cited as an example of almost ideal research conditions. Basic historical research was completed before excavations began rather than being carried out concurrently as is the case with many high priority development projects. Three seasons were allotted to excavation with sufficient staff to permit complete excavation; on other sites, development timetables have sometimes forced the pace of research rather more than is desirable for best results. The project historian worked on the site during the excavations, thereby adding materially to the quality of the inter-disciplinary approach; staff shortages in the past (less so at present) have usually prevented the historian from devoting this much time to a project. Control of the stabilization of ruins (for exhibit purposes) is in the hands of the archaeologist rather than of engineers. Artifact analysis is just beginning and for the first time we have a nucleus of trained analysts on the job thus permitting faster results and less loss of time due to dead-end approaches.

Another project in the final stages of completion is the "Mallorytown wreck". This is a British gunboat (possibly the Radcliffe) dating from the War of 1812 period. It was discovered and excavated in 1966. Recognizing the value of this vessel, the Research Division proposed that it be raised and preserved for exhibit. This was accepted by senior management and the raising and preservation were carried out by research staff in 1967. The preservation will be completed in 1969 and the

2.9 (2) Cont.

53-foot vessel will be moved to a nearby national historic park where it will become the focal point of an exhibit relating to the naval warfare on the Great Lakes. Preparation of the final report is well advanced with publication slated for next year. Thus, this project has contributed to our knowledge of naval architecture, preserved a unique specimen of a little known class of warship, and provided the nucleus of a major exhibit at an undeveloped national historic park.

In the area of historical research, the first section of a major three-part study on the fur trade in Canada has been completed for the Historic Sites and Monuments Board of Canada. Part 2 is scheduled for completion next year, with publication of both Parts 1 and 2 to follow in 1970. The study is designed to provide a framework within which the Board can consider individual sites proposed for commemoration. Beyond this, it provides a contribution to knowledge both in terms of hitherto unknown material and as a synthesis of existing, but scattered, data.

2.10 ORGANIZATIONS NOT CURRENTLY ENGAGED IN SCIENTIFIC ACTIVITIES

2.10 (1) Various studies are underway or contemplated which may result in improvement, but no radical changes are predicted as a result of technological developments. The major developments to date (e.g., computer processing of date, C14 dating) have provided new tools for the historian, but have not altered the theoretical framework or basic approaches.

2.10 (2) A mechanical method of washing artifacts has been devised by Research Division staff; this has been in operation for a year with labour savings estimated at \$10,000. Other improvements are under study in the areas of excavation and artifact recording. As stated above, various electronic surveying devices -- such as the resistivity meter and the magnetometer -- are being investigated. We are exploring the feasibility of electronic data processing and storage. As soon as resources permit, we intent to investigate the applicability of dendrochronology to Canadian historic archaeology.

2.10 (3) Advice has been sought from:

- (a) Department of Mines and Technical Surveys on the identification and dating of metal artifacts;
- (b) R.C.M.P. on the identification of human remains;
- (c) Department of Forestry on the identification of wood
- (d) National Museum of Natural Sciences on the identification of animal bones and molluscs;
- (e) National Museum of Man on evaluation of research proposals and reports in the field of prehistoric archaeology.

2.10 (4) See 2.10 (2).

Special Committee

NATIONAL PARKS SERVICE
PLANNING DIVISION
BRIEF TO
SENATE OF CANADA
SPECIAL COMMITTEE ON SCIENCE POLICY

2.2 Organization functions

- (g) To adequately perform our function and responsibilities there is need of a co-ordinating agency in the Federal Government to undertake research on recreational needs, demands, and resources, to co-ordinate general activities in the recreational field, to maintain liaison with the provinces, and to encourage development of an overall outdoor recreational plan.

An important current difficulty facing the Planning Division is the obtaining and training of sufficient and competent researchers and park planners.

2.3 Personnel Policies

- (a) During the summer months the Division employs a number of undergraduate university students in park use research and master planning studies. Through exposure to the Division the student's interest and potentiality may be developed. This aids in the identification and selection of university recruits for full time positions.
- (b) N/A
- (c) N/A
- (d) Current practice is to have research administrators recruited from among the research staff. Career advancement of the researcher is more limited than that of the administrator and accordingly distinctions do arise between administrators and researchers in terms of promotion and salary.
- (e) The Planning Division follows the usual departmental policy regarding intramural and extramural education for staff members.

2.4 Distribution of Activities

There exists no particular regional pattern to the Division's expenditure of funds on scientific activities. However, the Division does become involved in the assessment of National Park potentialities in the less developed regions of Canada and this may contribute to a form of regional development. Nevertheless, our basic concern is a fully representative and adequate National Park System.

2.5 Personnel associated with scientific activities

(a) current establishment positions:

total 31

professional - administration 5

research 20

support - technical 3

clerical

stenographic 3

(b) Professionals in administration 5

(c) please see separate questionnaires previously submitted.

(d) professionals by degree category.

	B.A.	M.A	PHD
1962	1	3	0
1963	1	4	0
1964	3	5	0
1965	5	6	0
1966	10	7	0
1967	12	7	0
1968	13	17	0
1968-69	13	18	0
1969-70	10	19	0
1970-71	5	29	0
1971-72	5	33	0
1972-73	5	34	0
1973-74	5	36	0

(e) percentage turnover of professional staff

	B.A.	M.A.	PL.
1962	-	-	-
1963	-	-	-
1964	-	20%	-
1965	-	-	-
1966	-	15%	-
1967	8%	-	-
1968	15%	18%	-

(f) percentage of current professional personnel who have:

been employed by industry	25%
been on staff of universities	6%
provincial departments	6%
other federal agencies	19%

(g) staff on educational leave - none

(h) number of university students in scientific activities

1962	unknown	1966	18
1963	unknown	1967	4
1964	10		
1965	13		

2.6 Expenditures associated with scientific activities

(a) funds spent on scientific activities by category:

	<u>64-65</u>	<u>65-66</u>	<u>66-67</u>	<u>67-68</u>
function:	intramural R&D	142,688	180,216	317,589
	data collection	35,671	45,053	79,397
scientific	engineering & technology	26,753	33,790	59,547
discipline:	natural sciences biological	35,671	45,053	79,397
	social sciences economics	35,671	45,053	79,397
	sociology	26,753	33,790	59,547
	demography	17,835	22,526	39,698
areas of application:	(8) health	8,900	11,263	19,849
	(12) regional development	17,850	22,500	40,000
	(13) social welfare and social policy	8,900	11,263	19,849
	(15) administration	24,000	33,600	60,000
	(6) transportation	8,900	11,263	19,849
	(16) other-recreation	107,000	135,161	238,200

(b) operating and capital funds:

	<u>Operating</u>	<u>Capital</u>
1964-65	131,	85,685
1965-66	131,262	47,097
1966-67	167,307	57,962
1967-68	280,556	116,430

* Please note - before 1965-66 the Planning Division did not operate as a separate entity with regard to the budgets. These were included under National Parks Service Administration, with no separate accounting for the Planning Division.

(c) funds expended to further professional university education

62-63	-
63-64	-
64-65	-
65-66	-
66-67	\$7,340
67-68	\$ 500
68-69	-

2.7 Research Policies(a) Units concerned with intramural research

- 1) Programmes and projects are selected by the Minister, initiated and monitored within the Branch. Other Federal agencies sometimes are involved, but only to a limited degree and they do not participate in the setting of objective or programmes.
- 2) Priorities are established by the Branch and by the Department. These priorities are expressed and reassessed every year in the Division's Programme Review.
- 3) The PERT network method is used by the long range planning section to plan and monitor dealings between provincial and federal authorities in the establishment of new parks.
- 4) During the last few years use has been made of contracting out projects in support of intramural programmes. This has been necessary because of the limitations in numbers and expertise of the Division's staff.

In all sectors of the Division use has been made of contracting out:

Town Planning - examples

- Dr. W. Oberlander, Professor in the Department of Community Planning, University of British Columbia. Townsite plans for Banff and Jasper.
- Project Planning Associates - Lake Louise and Waskesiu Townsite Plans.

Research Section - examples

- Ben Crow Associates, marketing researchers and consultants, study of Temple - Whitehorn Ski Area.
- Dr. J. Knetsch, Director of Natural Resources Policy Centre, George Washington University, consultant for Outdoor Recreation Demand Study.

Master Planning - examples

- Phillip Flores, landscape design and resource planning consultant East Lansing, Michigan, Master Plan Riding Mountain National Park
- Marshall, Macklen Monaghan engineers and planners, Toronto, Marmot Mountain Ski Area.

Long Range Planning - examples

- Acres Research, Toronto - Economic Impact Study of Bloodvein, Manitoba.
- Institute of Public Affairs, Dalhousie University - Economic Survey Kejimikujik Park Area.

5) N/A

6) The Planning Division has been developed too recently to experience the necessity of shifting research resources from one programme to a new programme. No process has been developed to do this.

7) There are no formal means of transferring research to outside agencies as most research is done for internal use. However, as the Division's work has national implications, our research and planning is of interest and benefit to certain individuals

and agencies. Such research results are transferred on an informal basis through distribution of the Division's reports, as well as through attendance and participation of officers at various national and international conferences, meetings and seminars.

(b) N/A

2.8 Research Output

- 1) N/A
- 2) Books and journal articles arising from research activities 1962-68.

Brooks, Lloyd:

"Demands of Forest Recreation on the Forester and the Forest Resources,"

Forestry Journal, 1963.

"National Parks for Canada's Northlands"

Canadian Society of Landscape Architects 1967

Eidsvik, Harold K:

"Planning a New National Park in Nova Scotia"

Community Planning Review, 1965.

Taylor, Gordon:

"Camping Equipment Trends in the National Parks of Canada"

Trends in Parks & Recreation, Jan '65.

"An approach to the inventory of Recreational Lands"

Canadian Geographer, June '65.

"Research in non-urban recreation"

Trends in Parks & Recreation, July '65.

"Proposed methodology for an inventory and classification of land for recreational use"

Forestry Chronicle June '66

"Research into Outdoor Recreation on Private Land"

Park News, Nov. '65

"Demand Study of Canadian Outdoor Recreation"

Parks and Recreation in Canada, 1968

3) Reports from Planning Division 1962-68

SPECIAL REPORTS

62-1 Proposed National Parks Zoning

Policy - Using the western

Mountain Parks as an Illustrative

Example

L. Brooks

January 17, 1962

62-2 Riding Mountain National Park -

L. Brooks

Katherine Lake Development Plan

H. Eidsvik

January 31, 1962

62-3 Point Pelee National Park - An

analysis of Attendance Figures

G.D. Taylor

February, 1962

62-4 Prince Edward Island Nat. Park

1961 Traffic Survey, 1961

G.D. Taylor

March, 1962

62-5 Prince Edward Island Nat. Park

Maximum Use Survey, 1961

G.D. Taylor

March, 1962

62-6 Trends in Location and Type of

Commercial Accommodation in

Four Mountain Parks

G.D. Taylor

March, 1962

62-7 Proposed National Park at

Kejimikujik Lake, Nova Scotia

G.D. Taylor

November, 1962

62-8 Proposed National Park on

G.D. Taylor

Bruce Peninsula, Ontario

L. Brooks

December, 1962

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63-1	Proposed Development for Tunnel Mountain, Banff National Park	H.K. Eidsvik	January, 1963
63-2	Terra Nova National Park, Saltons Brooks - Proposed Developments.	H.K. Eidsvik	January, 1963
63-3	National Park Potentials, Northwest Territories and Yukon, Report of Field Operation and Recommendations	Lloyd Brooks H.K. Eidsvik	January, 1963
63-4	Maligne Lake, Long-Term Development Plan.	Lloyd Brooks	January, 1963
63-4	Chadburn Lake; A Park Proposal	H.K. Eidsvik	April, 1963
23	Jasper National Park, Maligne Lake Long-Term Development Plan	L. Brooks	1962
24	Prince Edward Island National Park Proposed Development Plan	J.C. Jackson	February, 1963 (revised April, 1963)
	Recommended Nat. Parks Policy	J.C. Jackson	January 15, 1962
	National Parks Policy	J.C. Jackson	January 9, 1962
25	Terra Nova National Park Sandy Pond Beach Development	L. Brooks	October, 1963
26	Kootenay National Park Radium Hot Springs Redevelopment	L. Brooks	October 16, 1963
27	Elk Island National Park Relationship of Zoning and Interpretive Plan to Long-Range Development	H.K. Eidsvik	October, 1963

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|----|--|--------------------|-----------------|
| 28 | An Economic Study of Accommodation
in Banff, Jasper, Yoho and
Kootenay National Parks - 1963 | J.B. Ramsey | December, 1963 |
| 29 | Proposed Development for the
Two Jack Camping Area,
Banff National Park. | H.K. Eidsvik | January, 1964 |
| 30 | Facility and Operational Report
IX Winter Olympics, Innsbruck | H.K. Eidsvik | March, 1964 |
| 28 | Wood Buffalo National Park,
A Significance Study | C.L. Merrill | December, 1963 |
| 31 | Planning New National Parks
in Canada: A Case History | H.K. Eidsvik, | 1964 |
| 32 | Prince Edward Island
Shoreline Reconnaissance | C.L. Merrill | July, 1964 |
| 33 | Reconnaissance Renfrew County | C.L. Merrill | July, 1964 |
| 31 | Shoreline Reconnaissance
Terra Nova National Park,
Newfoundland. | G. Lee
D. Cline | October, 1964 |
| 34 | A Reconnaissance of the Proposed
National Park, Kejimikujik Lake,
Nova Scotia | G. Lee | October, 1964 |
| 35 | Review of Park Potential
Beaubear's Island, New Brunswick | H.K. Eidsvik | September, 1964 |
| 36 | Cape Breton Highlands Land
Acquisition Program, East Coast | H.K. Eidsvik | September, 1964 |

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|----|---------------------------------------|--------------|----------------|
| 37 | The Planning-Development Process | L. Brooks | |
| | | H.K. Eidsvik | November, 1964 |
| | | | |
| 38 | Reconnaissance Survey Report | | |
| | National Park Potential in the Elliot | | |
| | Lake and Pukaskway Areas, Ontario | C.L. Merrill | January, 1965 |
| | | | |
| 39 | Winter Recreation and the National | | |
| | Parks - A proposed Management | | |
| | Policy and a Development Program | | |
| | for the National Parks of the | | |
| | Rocky Mountains. | L. Brooks | January, 1965 |
| | | | |
| 40 | Cape Breton Highlands National Park | | |
| | Boundary Revisions and Interior | | |
| | Development - A Preliminary Report | H.K. Eidsvik | April, 1965 |
| | | | |
| 41 | Glacier National Park | | |
| | Rogers Pass Development | L. Brooks | May 11, 1965 |
| | | | |
| 42 | Overnight Accommodation in National | | |
| | Parks | L. Brooks | June, 1965 |
| | | | |
| 43 | National Parks of Canada - | | |
| | Preliminary Plan for a Secondary | | |
| | Road Program | L. Brooks | June 2, 1965 |
| | | | |
| 44 | National Park Potentials in | | |
| | Saskatchewan | C. Merrill | June, 1965 |
| | | | |
| 45 | Boundary Bay - Point Roberts, | G.D. Taylor | |
| | Examination of Park Potential | H.K. Eidsvik | July, 1965 |
| | | | |
| 46 | The Rideau Waterway - A | G.D. Taylor | |
| | Preliminary Study | G.L. Merrill | August, 1965 |

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| 47 | Glacier National Park,
Rogers Pass Area | H.K. Eidsvik | September, 1965 |
| 48 | Proposed Bonne Bay National Park | G.O. Lee | November, 1965 |
| 49 | Current Canadian Periodicals on
Outdoor Recreation | P. Matrosovs | November, 1965 |
| 50 | Fundy - Wolfe Lake Activity Centre | D.N. Major | December, 1965 |
| 51 | Point Roberts - A proposal for
Future Land Use | P. Matrosovs | March, 1966 |
| 52 | Kouchibouguac Bay National Park -
A Recommendation | D.E. Cline | May, 1966 |
| 53 | Ship Harbour: A National Proposal | D.E. Cline | November, 1966 |
| 54 | A Preliminary Examination of Two
Potential National Parks in Manitoba | G.D. Taylor | November, 1966 |
| 55 | Dinosaur Provincial Park -
A National Proposal | G.D. Taylor | December, 1966 |
| 56 | Proposed National Park -
Prince Edward Island | P. Matrosovs | December, 1966 |
| 57 | Kouchibouguac National Park,
Economic Effects and Cost Analysis | D.N. Major | March, 1967 |
| 58 | Prairie National Park,
Saskatchewan - Boundary Proposal | D. Lockwood | April, 1967 |
| 59 | Waterton Townsite - Generalized
Master Plan | G. Miller | April, 1967 |

Cavendish Beach Area -		
Interim Report	D.N. Major	May, 1967
Jasper Townsite Zoning Regulations		
	G. Miller	May, 1967
Waterton Townsite		
Zoning Regulations	G. Miller	May, 1967
60 Land Acquisition Program,		
Banff Townsite	D.H.C. Kettle	September, 1967
61 Population Trends in Relation		
to the National Parks System	D.H.C. Kettle	November, 1967
62 National Parks Service - Planning,		
Proposed New Organization	L. Brooks	February, 1968
Sixth Federal-Provincial Parks		
Conference	W.D. Gallacher	September 29, 1967

PLANNING DIVISION RESEARCH REPORTS

1. Park Use Survey Waterton Lakes		
National Park, 1961	G.D. Taylor	May 1962
2. Trailer Entries - National Parks		
1960-61	G.D. Taylor	June, 1962
3. Park Use Survey - Riding Mountain		
National Park, 1962	G.D. Taylor	February, 1963
4. Prince Edward Island National		
Park - Maximum Use Survey, 1962	G.D. Taylor	March, 1963
5. Prince Edward Island National		
Park - 1962 Traffic Survey	G.D. Taylor	March, 1963

6. Some Comments on the Commercial
Accommodation in Banff National
Park G.D. Taylor March, 1963
7. Park Use Survey,
Cape Breton Highlands Nat. Park
1962 G.D. Taylor May, 1963
8. 1962 Travel Survey, Banff,
Jasper, Kootenay and Yoho National
Parks G.D. Taylor January, 1964
9. 1963 Public Use Survey
Terra Nova National Park G.D. Taylor March, 1964
10. Camping Equipment National
Parks 1963 G.D. Taylor April, 1964
11. Camping, Cape Breton Highlands G.D. Taylor April, 1964
12. A Camper Survey, Tunnel Mountain
and Two Jack Lake Campgrounds,
Banff National Park G.D. Taylor June, 1964
13. Traffic Report 1964 - Fundy
National Park G.D. Taylor February, 1965
14. The Visitor to Fundy National
Park 1964 G.D. Taylor March, 1965
15. Prince Edward Island National
Park - Traffic Studies 1961 -
1964 G.D. Taylor March, 1965
16. Seasonal Camping - Prince
Albert National Park G.D. Taylor March, 1965

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| 17. | Mount Norquay Ski Study 1965 | | |
| | Banff National Park | G.D. Taylor | October, 1965 |
| 18. | Staff Accommodation, | | |
| | Banff National Park, 1964 | G.D. Taylor | October, 1965 |
| 19. | Visitors to Five National | | |
| | Historic Parks, 1965 | G.D. Taylor | February, 1966 |
| 20. | An Appraisal of Public Reaction | | |
| | to Campground Facilities and | | |
| | Standards - Two Jack Lake | | |
| | Campground, Banff National Park, | | |
| | 1965 | G.D. Taylor | April, 1966 |
| 21. | Traffic Report - Cape Breton | | |
| | Highlands National Park, 1965 | G.D. Taylor | July, 1966 |
| 22. | Wilderness Travel Survey | G.D. Taylor | Not released |
| 23. | Visitors to National Parks - | | |
| | A Summary Report | G.D. Taylor | November, 1966 |
| 24. | Visitors to Waterton Lakes | | |
| | National Park, 1966 | J.W. Thorsell | Spring, 1967 |
| 25. | Visitors to Kootenay National | | |
| | Park, 1965 | H.N. Nixon | February, 1967 |
| 26. | Staff Accommodation - Jasper | | |
| | National Park, 1966 | H.N. Nixon | March, 1967 |
| 27. | Fort Wellington National | | |
| | Historic Park - A Visitor | | |
| | Use Study | G.D. Taylor | February, 1967 |

28. Banff National Park -
Aspects of Visitor Use N. Nixon March, 1967
29. The Visitor to Yoho National
Park J.W. Thorsell May, 1967
30. St. Lawrence Islands National
Park - A Visitor Use Study, 1966 G.D. Taylor July, 1967
31. Jasper National Park, Visitor
Use Survey, 1966 H.N. Nixon November, 1967
32. An Analysis of Mountaineering and
Ski Touring Registrations, Banff
National Park, 1966-67 J.W. Thorsell December, 1967
33. Trail Use Survey Banff and Yoho
National Park, 1967, Also,
Appendix E J.W. Thorsell February, 1968
34. Prince Albert National Park
Visitor Use Survey, 1967 H.N. Nixon January, 1968
35. Elk Island National Park,
Visitor Use Survey, 1967 H.N. Nixon November, 1967
36. Lower Fort Garry National Historic
Park - A Visitor Use Study, 1967 Miss M.E. Hirsch April, 1968
37. Riding Mountain National Park,
Visitor Use Survey 1967 H.N. Nixon May, 1967
38. Mountain National Parks;
Some Aspects of Winter Use J.W. Thorsell June, 1968
39. Riding Mountain National
Park Visitor Pattern Survey H.N. Nixon July, 1968

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Planning Division
Provisional Master Plans

Kejimikujik National Park, Nova Scotia Master Development Plan.	H.K. Lidsvik	March, 1965
Fundy National Park, New Brunswick Park Master Plan.	D.N. Major	September, 1966
Terra Nova National Park Provisional Master Plan.	D.N. Major	December, 1966
Waterton Lakes National Park Provisional Master Plan.	P. Matrosovs	April, 1967
St. Lawrence Islands National Park Provisional Master Plan.	G.O. Lee	June, 1967
Riding Mountain National Park Provisional Master Plan.	Philip E. Flores (consultant)	September, 1967
Jasper National Park Provisional Master Plan	D.N. Lockwood	December, 1967
Banff National Park Provisional Master Plan - 1967.	D.N. Lockwood	December, 1967
Kootenay National Park Provisional Master Plan - 1967.	D.N. Lockwood	December, 1967
Yoho National Park Provisional Master Plan - 1967.	D.N. Lockwood	December, 1967

4) means to transfer information of a project to extramural groups.

(1) conferences - participation and papers:

Canadian Association of Geographers
 Canadian Institute of Foresters
 Canadian Society of Landscape Architects
 Conservation Council of Ontario
 Federal-Provincial Parks Conference
 International Union for the Conservation of Nature
 Northern Resource Conference
 Virginia Outdoor Recreation Symposium
 World Forestry Congress
 XIV International Congress, IUFRO
 American Institute of Park Executives
 National Forestry Conference
 Parks and Recreation Association of Canada
 Northeast Fish and Wildlife Conference
 Provincial Conference on Parks and Recreation, Toronto
 Canadian Symposium of Recreation
 International Congress of the International Landscape Architects
 Park Naturalists Conference
 Eastern Canada Conference on Camping and Roadside Development

(ii) committee membership:

Canada-Ontario Rideau Study Group
 Intergovernmental Committee on Outdoor Recreation
 Interdepartmental Committee on Resources ad Hoc Committee on
 Recreation
 Joint Committee on National Parks - Canada and United States
 National Committee on Forest Land
 North American Forestry Commission of FAO Wildlife and Recreation
 Committee
 Research Committee of Conservation Council of Ontario

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(iii) seminar participation:

Civic Affairs Committee, Vancouver Board of Trade
 Federal-Provincial Land Inventory Seminar
 Land Use Seminar, Department of Geography, Carleton University
 Parks and Leisure Seminar, University of British Columbia
 Recreational Planning Seminar, Department of Geography,
 University of Saskatchewan
 Symposium on Forest Recreation
 Faculty of Forestry, University of Laval

5) N/A

6) N/A

7) N/A

8) N/A

9) Activities of the Planning Branch have increased knowledge of national parks in respect to the park users and resources within the park and within potential park areas. However, the impact of our activities on scientific knowledge generally is negligible. While the establishment of a National Park does bring about economic development in the surrounding region, this is not the park's prime aim. The amount of economic development varies with the region. The actual impact of scientific activities must be said to be secondary on Canadian economic development.

10) N/A

2.9 Projects

1) Title of projects 1962-68

Long Range Planning: surveys and reports on:

1962 Bruce Peninsula

Kejimikujik N.S.

1963 Yukon

Nahanni - Great Slave Lake

1964 East Point P.E.I.

1965 Serpentine River Nfld.

Rideau Lakes

Boundary Bay - Pt. Roberts

Elliot Lake

Pukaskwa

Cypress Hills Sask.

Val Marie Sask.

Grose, Morne Nfld.

1966 Northumberland Strait

Atlantic Coast N.S.

Canadian Shield Man.

1967 Dinosaur Prov. Pk Man.

Master Planning - Provisional Master Plans for:

Waterton Lakes

Elk Island

Glacier

Prince Albert

Revelstoke

Riding Mountain

Yoho

Point Pelee

Kootenay

Fundy

Jasper

Banff

Kejimikujik

Terra Nova

Cape Breton Highlands

Prince Edward Island

St. Lawrence Islands

Georgian Bay Island

other projects:

Ground Cover Study - Waterton Lakes
 Yoho Valley Plan
 Jasper Miette Hot Springs Plan
 Banff/Yoho Corridor Plan
 Prince Albert Kingamere Plan
 Maritime Parks Activity Centre Plans
 Park Expansion Program

Policy:

National Parks Policy

Research: user studies of:

Kootenay
 Yoho
 Jasper
 Waterton
 St. Lawrence Islands
 Ft. Wellington National Historic Park
 Point Pelee
 Fort Malden National Historic Site
 Lower Fort Garry
 Prince Albert
 Mountaineering and Ski Touring Banff
 Trail Use - Banff and Yoho
 Riding Mountain
 St. Lawrence Islands
 Demand Study - Mountain Parks
 - Maritime Parks

Town Planning: townsite plans of:

Banff
 Jasper
 Prince Albert (Waskesiu)
 Riding Mountain (Wasagaming)
 Yoho (Field)

2) Significant completed projects:

All projects fall under the applied research heading

Long Range Planning - this section is responsible for the searching out and assembling of potential park areas as representative examples of Canadian Landscape. Analyses of the areas resources are made. More recent reports have made more comprehensive analyses involving a team participation by biologist and wildlife experts, economists and representatives from the mining and forestry fields. An economic impact study is also included.

A representative example of this team approach was taken in the Bloodvein, Man. study. Investigation of 19 areas has been made.

Master Planning - the first step in the planning of an established park is the making of a Provisional Master Plan organization and evaluating data on floral, fauna, geology, climate, fish and water. A general development plan is produced based on this date, again incorporating a team approach. This involves engineering, wildlife, and social inputs for the planning area. A model study is that of Banff National Park.

Town Planning - Town planners have been used in the evaluation and planning of existing service centres in the national parks. Significant work has been done by this section in amendments to the National Parks Act. This has resulted in townsite legislation for Banff and Jasper in 1967 and 1968 respectively.

Research Section - is responsible for the provision of a bank of information on national park use and trends, in co-ordination with the Master Planning Section. It is anticipated that after the initial use study for each park, a follow up study will be undertaken every five years as will be the case with master plans. The key user study is the Riding Mountain National Park User Study 1967-68. The methodology used in this report will be used in all subsequent work.

A significant contribution of the Research Section has been in the initiation and co-ordination of the Outdoor Recreation Demand Study. This is the first attempt at a nation-wide study of recreational resources

and needs. This study is intended to provide information on motives and activities of the entire Canadian population. This information is to be used in the establishment of new parks and in the continuing development of existing ones. This has involved co-ordinating and attaining the co-operation of federal and provincial departments as well as private agencies and consultants. All provincial governments and such federal agencies as the Canadian Government Travel Bureau, and the Dominion Bureau of Statistics are directly involved.

Policy - in the preparation of long range plans for the development of a sound National Park System consideration must be made of the legislation, the ultimate objectives of each of the parks and of the system as a whole. Thus a clear conception of park purpose and policy is required to direct planning of the individual units and the park systems, as well as a guide to the administration of this system. Previously the general purpose of the National Parks had been interpreted in many different ways, causing conflict of purpose in the administration, as well as in the development of the individual units of the system. With the establishment of a positive, organized and coherent statement of policy, planning now proceeds toward sound objectives.

2.10

- 1) With the simplification and increased sophistication of computer methods, increased use of computer techniques will be made in all phases of planning and research.
- 2) This will allow more comprehensive scientific research into outdoor recreation demands and needs in a more leisure oriented, mobile society.
- 3) The main type of technical advice sought in the last five years has been in regard to our Outdoor Recreation Demand Study. The source of our advice has been Dr. J.L. Knetch, an American consultant in the economics of recreation at George Washington University. He was subsequently hired as a part-time adviser in design and co-ordination of the study.

BRIEF FOR THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICYNATIONAL PARKS SERVICE - OPERATIONS DIVISIONINTERPRETATION SECTIONSUMMARY

- A. The Interpretation Section engages in scientific activities in three general categories:
- in established National Parks, when the information is needed to preserve park values, to interpret the park to visitors or to characterize a park as part of a national system.
 - in proposed areas for inclusion in the system of National Parks. Such areas are assessed for their validity as nationally significant, high quality, unimpaired and adequate examples. Interpretive potential is assessed. Problems are anticipated when possible. Much of this function is in the form of a service to the Planning Division of the National Parks Service.
 - controls under permit, the activities of outside persons and agencies wishing to pursue their own scientific programs in National Parks. Permits are granted to qualified persons or agencies if their programs are scientifically valid, will not impair park values and cannot be carried out elsewhere.
- B. The Interpretation Section carried out scientific activities through its own research staff, presently numbering one, to be increased to two as of November 1. Field staff do not normally undertake scientific activities.
- C. The Interpretation Section obtains the services of qualified scientists through contracts when necessary or desirable.
- D. Scientific activities are carried out as part of a service to, and in the best interests of, the nation, under the clause of the National Parks Act dedicating National Parks to the "benefit, education and enjoyment of the people" and requiring that the parks be maintained unimpaired.

- E. It is expected that scientific activities in National Parks will increase as park utilization increases, as new parks are required, and as the growing world population puts increased stress on the total environment.

Part II

2.2 Organizational Functions

- (c) Contacts with -
 - (i) Other Federal agencies -
 - Departments of Forestry; Energy, Mines and Resources, Secretary of State.
 - (ii) - industry - none
 - (iii) - educational institutions - with many universities, through contracts or permission for research.
 - (iv) - international - Section personnel participate in the International Biological Program (I.B.P.), a world-wide organization with United Nations affiliation, which investigates all aspects of interactions between living organisms, including man, and their environment. It is expected that some I.B.P. scientific activities will be carried out in National Parks, and that active collaboration will take place.
 - (v) - other - through contracts with, or permission to research granted to, some selected scientific workers.
- (d) Operational effectiveness, duties and goals are under continual review and are revised annually as needed, when employee appraisals are performed.
- (e) Outside studies - Ecological studies, to study primitive natural communities in parks and the present or future effect of man's activities on them. Several studies now in progress. Archaeological studies, to determine the impact of planned park development on buried historical values. Major projects under way in Waterton Lakes National Park and Point Pelee National Park. Geological studies, to assess fossil beds, mineral occurrences, glacier phenomena and so on. Several studies now under way or planned for 1969. A continuing program of research into natural

cave phenomena has been carried out in three mountain parks for the past three years and is expected to continue for several more years. Major visitor developments may result from this work.

- (f) In order to meet its responsibilities under the dedication clause of the National Parks Act, the Department will in the foreseeable future have to increase its involvement in scientific activities by increasing its staff, increasing its contract activities, or both.
- (g) Lack of a clearly defined research policy has been probably the major hindrance to effective performance of scientific activities, with lack of staff a significant contributing factor.
- (h) An increase in research staff (to 2) is imminent (Nov. 1, 1968). A research policy is under preparation, and is expected to be available in the spring of 1969.

2.3 Personnel Policies

- (a) No formal steps are taken by this section to identify and hire graduating researchers. Informally, graduates are contacted when they come to our attention.
- (b) No unique criteria for research staff have been developed.
- (c) One headquarters staff member has been designated as responsible for "Interpretation Research and Planning". One field staff member has been appointed to a headquarters position.
- (d) No formal distinction has been made, since no classification exists for a position which is wholly research or wholly research administration.
- (e) No formal policy is in effect. One research staff member has been granted educational leave to take a graduate degree in Science (Biology).

2.4 Distribution of Activities

- (a) Scientific activities by the Interpretation Section can and do take place in any region of Canada where a national park exists or is contemplated.
- (b) All types of scientific activity associated with national

parks could theoretically take place in every park, with obvious exceptions such as the exclusion of most forestry activities in a truly prairie park.

- (c) No scheduled annual activities other than annual field travel by Ottawa staff to all three regions (Western, Central and Atlantic).
- (d) The role of this section in contributing to regional development is restricted to an organizational role in the development of the national parks, and such development takes place within park boundaries.
- (e) N/A

2.5 Personnel

As stated previously, there is at present only one staff member engaged in scientific research. The personnel questionnaire submitted gives relevant details.

2.6 Expenditures

This information would be extremely difficult to extract from the financial records of the National Parks Service as a whole, and as expenditure on research so far has been relatively small, it is not considered significant enough to warrant the time required to compile this data.

2.7 Research Policies

- (a) A research policy is now being developed. To date, scientific activities have been undertaken either when the need arose or when a favourable opportunity presented itself. Programmed research is being developed and will become policy when all aspects are agreed upon. In the meantime, each project is treated individually. Programs are presently contemplated for Waterton Lakes National Park (Archaeology), Point Pelee National Park (Ecology), Banff and Jasper National Parks, (Ecology, Geology).

A further analysis does not appear to be warranted at this time, because of the limited scope of the program.

(b) N/A

2.8 Research Output

1) N/A

2) A bibliography of the extensive scientific literature on Point Pelee National Park has been published and put on sale to the public.

A series of handbooks on the geology of the national parks has been published, though this series was not the direct responsibility of this Section.

3) Numerous reports, retained within the Branch, have been produced by contract scientists and by Ottawa staff.

2.9 Projects

It is probably too early to comment on this section. Most projects and programs are still in progress. Many are too restricted in scope at this stage to qualify for discussion.

The most important projects currently under way are the archaeological investigations at Waterton Lakes and Point Pelee National Parks, a forestry-oriented ecological study by the Forestry Department in Waterton Lakes, the beginnings of an ecological investigation at Point Pelee, and the cave research program in Glacier, Banff and Jasper National Parks.

2.10 Effects of Scientific Activities

General comments only are applicable here. In the future, development of the National Parks system will undoubtedly rest more heavily on information supplied through scientific activities and agencies. Scientific input will be required at all stages, from the first selection of areas for national parks, through development and interpretation, to continuing maintenance of park values in the face of visitor use pressures.

Modern discoveries, technologies and improvements will have considerable effect on all aspects of park activities but it is not foreseeable that these will change the basic concept or practice of the National Parks philosophy. More people will have to be accommodated in a larger number

of parks, and will have to be served with a higher quality program more closely geared to the main purpose of National Parks. Briefly stated, this is to allow visitors to experience the natural world without altering it. All developments of science and technology which apply to this purpose will have a bearing on the operation of the National Parks system in Canada.

BRIEF FOR THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICYENGINEERING AND ARCHITECTURAL DIVISIONNATIONAL AND HISTORIC PARKS BRANCH2.1 Organization

The organization of this Division is geared to executing a capital program. The organizational structure is not adapted for the purpose of scientific investigation.

2.5 Personnel

None of the Division staff are involved to the extent that a major portion of their time is devoted to scientific investigation; this activity is ancillary to other applied objectives.

2.6 Expenditures

No monies are expended on educational grants for immediate or long-term scientific investigation.

Funds consumed intramurally or through consultants on the acquisition of new engineering knowledge, primarily in the restoration and construction fields, are not identifiable as they are spent in conjunction with comprehensive restoration, design and construction projects.

2.8 Research Output

"Restoration of the Louisbourg Fortress" by A.D. Perry, Science Affairs, September 1968;

"Restoration of the Fortress of Louisbourg" by A.D. Perry, EIC Journal, April 1968.

2.9 Projects

Areas of semi-scientific investigation include:

- 1) Avalanche Control, Glacier National Park in conjunction with the National Research Council.
- 2) Stabilization and restoration of historic structures.

2.10 Effects of Scientific Activities

Areas of interest in which effectiveness could be improved through new scientific or technical developments:

- 1) Development of a small package, self-contained, maintenance-free sewage treatment and disposal unit. This would help prevent water pollution in National Parks which are generally

- 2) Study the general sociological effects of highly urbanized living and population pressures as they relate to the need for natural, outdoor, space-oriented recreation and man's need to keep in touch with a natural environment.
- 3) Study the techniques of managing a natural environment through its normal cycles in spite of the unnatural activities, intrusions, observations, etc., of man.
- 4) Broad land use research in the field of ratios of habitation, food production, non-renewable and renewable resource exploitation, waste areas, essential watershed, etc., as applied to areas devoted to conservation and preservation of a natural environment for the study and recreation of man.
- 5) Study and develop the techniques of undersea conservation, observation, preservation and presentation to the public of underwater and shoreline National Parks on the continental shelves.
- 6) Transportation methods for remote areas having minimum impact on the natural environment while moving moderate numbers of people as freely as possible through the area.
- 7) Stabilization of decaying timber through polymerization of impregnated chemicals via irradiation.

2.5.c CHART I Parks & Historic Sites

B.A.'s, M.A.'s, and Ph.D.'s employed in Parks and Historic Sites Branch, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Country of Birth	B.A.				M.A.				Ph.D.
	Canada	Poland	Latvia	U.S.A.	Canada	England	U.S.A.	Scotland	Canada
Country of Training									
Secondary Schooling									
Canada	17	1	1	1	9				1
U.S.A.				2			2		
England						2			
Scotland								1	
B.A.									
Canada	14	1	1	1	8		1		1
U.S.A.	2			2	1		1		
England	1					1			
Wales						1			
Mexico							1		
M.A.									
Canada					5				1
England						1			
U.S.A.					3	1	2		
Scotland								1	
Ph.D.									
Australia									1
Able to operate effectively in both languages	3	1	-	-	1	-	-	1	-

Special Committee

2.5.c CHART II Parks and Historic Sites

Average number of working years since graduation and average number of years employed in present organization, B.A.'s, M.A.'s, and Ph.D.'s employed in Parks and Historic Parks Branch, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

[illegible]

BRIEF

TO

SENATE COMMITTEE ON SCIENCE POLICY

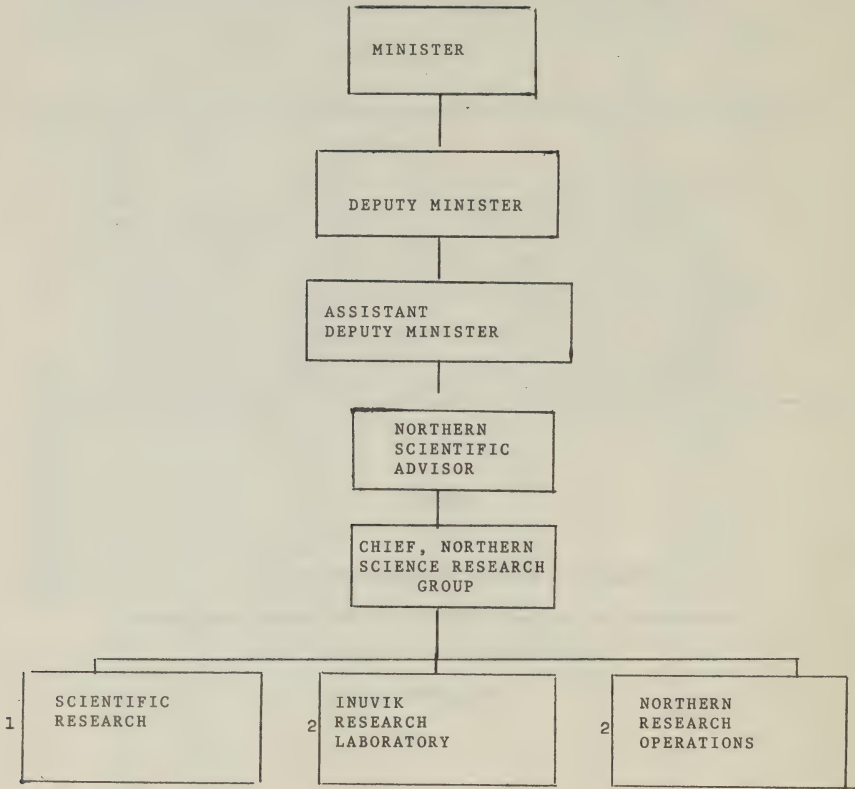
Department of Indian Affairs and Northern Development

Northern Science Research Group

December 1968

2.1.c.

Northern Science Research Group (formerly Northern Co-ordination and Research Centre)



The Northern Science Research Group conducts and coordinates research on Arctic and sub-Arctic areas. It has formal and informal ties with the other branches in the Department, with other Departments, and with Universities and private institutions throughout Canada.

- 1. - Substantial Scientific Research
- 2. - Scientific Support

NORTHERN SCIENCE RESEARCH GROUPPart II:II. 2. Content of Submissions2.1 Organizations N/A2.2 Organizational Functions

- a) The Department of Northern Affairs and National Resources
&
b) Act of 1953 in Section 6, Subsection (c) charged the
Minister of Northern Affairs and National Resources
with responsibility for "fostering, through scientific
investigation and technology, knowledge of the Canadian
north and of the means of dealing with conditions related
to its further development." As one response to this
charge, the Northern Co-ordination and Research Centre
was established. In the Government Re-organization
Act of 1966, this responsibility remained unchanged,
but in January, 1968, the functions of the Northern
Co-ordination and Research Centre were separated, and
its principal scientific research responsibilities
were assigned to the Northern Science Research Group,
which operates under the direction of a Northern
Scientific Adviser, who has been appointed to advise
on scientific and technological matters, and to direct
these activities within the department. The Northern
Scientific Adviser, assisted by the Northern Science
Research Group provides scientific information and
advice to the department and elsewhere, conducts or
arranges for the conduct of research programs to meet
departmental requirements, assists scientific research
by other institutions and individuals in the north,
and co-ordinates northern research throughout the
government.
- c) (i) The department does not attempt to carry out
research in a discipline where there is a well-
established government agency already active in the
field. For instance, the Geological Survey carries
out northern geological research, the Hydrographic
Survey carries out northern hydrographic surveys,
the National Museum and Department of Agriculture
carry out northern research in botany, etc. The
departmental role lies in the co-ordination
and support of these activities. The main machinery

11. 2.2

for co-ordination is the Scientific Research Sub-Committee on Northern Development. The Northern Scientific Adviser is chairman of this sub-committee which has representatives from government agencies carrying out research in the north. Assistance to research programmes of other Departments is given through the provision of northern facilities, especially those of the Inuvik Research Laboratory;

(ii) advice is given to industry on northern conditions and scientific matters, or the inquiries are directed to the appropriate specialized agency. Industrial research also uses the facilities of the Inuvik Research Laboratory;

(iii) advice on northern conditions and scientific matters is given to universities and other educational institutions intending to work in the north. University staff and graduate students are employed on research projects for the department either as seasonal employees or under contract. A program of grants for northern research by universities has been established. Support and facilities are provided in the field, particularly through the Inuvik Research Laboratory;

(iv) liaison is maintained with polar agencies in other countries, and northern development in other northern areas is studied.

Representatives frequently attend international conferences, but no officers are permanently stationed abroad. The Minister has, however, considered the appointment of a northern specialist from the department to a Canadian Embassy in northern Europe to watch northern development in Scandinavia and the USSR;

(v) the responsibility for co-ordination of northern scientific activities has led to membership in several national scientific committees, such as the Canadian Co-ordinating Committee for the International Geophysical Year and the International Biophysical Program, N.R.C. Associate Committees, etc.

d) Operational effectiveness and goals are reviewed and revised through conferences, meetings, the Annual Program and Estimate Reviews and periodic Program Management Evaluation studies.

e) Not applicable.

II. 2.2

- f) With such a broad field of responsibilities, current limitations of staff and resources do not allow more than an attempt to cover the most important and most urgent requirements. Most of the research effort has therefore been concentrated on the social problems of the north.
- g) The major hindrances are two-fold. One lies in the current restrictions on establishment and resources, aggravated by the pressing operational commitments of the department which have to be met from the same resources. The other lies in the difficulty of attracting professional staff, especially in social anthropology, in the face of competition from universities for the small number of suitably qualified scientists.

2.3 Personnel Policies

Awareness of the availability of promising young graduates at universities is maintained through both formal and informal contact with members of university departments, who are kept informed of opportunities for employment in this department. No unique criteria have been developed to help to identify those who will be effective researchers.

Provision for the identification of persons with high potential for posts in research administration is made in the department-wide Employee Evaluation Program, which is designed to identify the special potential of all employees. Provision for in-service training, intra-mural and extra-mural, is also a feature of a department-wide program in which promising members of the department are provided with periodic opportunities to gain further training and education.

2.4 Distribution of Activities

The significant aspect in the regional pattern of expenditure on research by this agency is in the distribution of grants to university groups across the country. The purpose of these grants is to offset in some degree the high costs of field training in the north for young scientists, and to encourage the development of scientists with some experience in the north and some commitment to future northern work. The distribution of these grants since the program began is noted below:

Special Committee

GRANTS FOR NORTHERN RESEARCH AND FOR
NORTHERN SCIENTIFIC RESEARCH EXPEDITIONS

<u>Northern Research Institutes</u>	<u>Year</u>	<u>Amount of</u> <u>Grant</u>
Arctic Studies Group (University of Montreal)	1965/66	\$ 3,000
	1966/67	10,000
	1967/68	10,000
	1968/69	8,000
Boreal Institute. (University of Alberta, Edmonton).	1962/63	4,800
	1963/64	4,800
	1964/65	5,000
	1965/66	6,500
	1966/67	7,000
	1967/68	11,000
	1968/69	13,000
Can. Research Centre of Anthropology. (St. Paul University, Ottawa).	1962/63	1,200
	1963/64	1,200
	1964/65	5,000
	1965/66	5,000
	1966/67	6,500
	1967/68	8,000
	1968/69	9,000
Centre d'Etudes Nordiques. (University of Laval).	1962/63	6,000
	1963/64	7,000
	1964/65	13,000
	1965/66	20,000
	1966/67	25,000
	1967/68	27,000
	1968/69	27,500
Committee on Arctic & Alpine Research. (University of B.C., Vancouver).	1962/63	1,500
	1963/64	4,000
	1964/65	12,000
	1965/66	15,000
	1966/67	22,500
	1967/68	27,000
	1968/69	27,500
Committee on Northern Studies. (University of Manitoba)	1962/63	1,500
	1963/64	1,500
	1964/65	5,000
	1965/66	8,000
	1966/67	16,000
	1967/68	20,000
	1968/69	22,500
President & Committee on Northern Area Studies. (Lakehead University, Port Arthur).	1966/67	3,000
	1967/68	4,000
	1968/69	3,500

Institute for Northern Studies. (University of Saskatchewan, Saskatoon)	1962/63	\$ 6,000
	1963/64	7,000
	1964/65	12,000
	1965/66	15,000
	1966/67	24,000
	1967/68	27,000
	1968/69	30,000

Institute of Social & Economic Research. (Memorial University, St. Johns Nfld.)	1963/64	5,000
	1964/65	5,000
	1965/66	10,000
	1966/67	12,500
	1967/68	17,000
	1968/69	17,000

McGill Committee for Northern Research. (McGill University, Montreal)	1964/65	5,000
	1965/66	5,000
	1966/67	10,000
	1967/68	11,000
	1968/69	10,000

Committee for Arctic & Sub-Arctic Research. (University of Toronto).	1967/68	19,500
	1968/69	19,500

Arctic Studies Conference. (To be hosted by different universities)	1967/68	5,000
	1968/69	5,000

Bishops University for the Senate Committee on Northern Research.	1968/69	1,000
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Northern Scientific Expeditions

Somerset Island Expedition. (University of Ottawa)	1963/64	1,000
	1964/65	12,000
	1965/66	16,000
	1966/67	13,500
	1967/68	8,500
	1968/69	2,500

Cape Dyer - Baffin Island Exp. (University of Toronto)	1964/65	7,500
	1965/66	7,500

Jacobsen McGill Expedition. (McGill University)	1962/63	16,200
	1963/64	16,000
	1964/65	5,000

Special Committee

Non-University
Northern Scientific Expedition.

Devon Island Expedition.	1962/63	\$	10,800
(Arctic Institute of North America).	1963/64		10,000
	1964/65		10,000
	1965/66		10,000
	1966/67		15,000
	1967/68		15,000
	1968/69		14,000

Icefield Ranges Research Project.	1965/66		7,500
(Arctic Institute of North America).	1966/67		12,000
	1967/68		15,000
	1968/69		15,000

General Funds.	1962/63		12,000
(Arctic Institute of North America)	1963/64		12,500
	1964/65		23,500
	1965/66		16,500
	1966/67		20,000
	1967/68		25,000
	1968/69		25,000

Yukon Research & Development Inst.	1966/67		3,000
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II. 2.4

In-house research, directed toward practical problems in the Northwest Territories and the Yukon, has for the most part been concerned with investigation of the problems of native people resulting from conditions of northern life. Study of human development in the north, within the framework of the social sciences, has been our central research concern, although some research of a technological nature, in support of departmental activities, has been conducted.

2.5 Personnel Associated with Scientific Activities

a)	Administrative and Foreign Service Category	5
	Administrative Support Category	8
	Scientific and Professional Category	8
	Research Scientists under contract -- Ottawa	10
	Research Scientists under contract -- Inuvik	5
	Scientific Guest Workers -- Ottawa -- up to 5 (the number varies throughout the year)	
	Scientific Guest Workers -- Inuvik -- up to 200 (the number varies throughout the year)	
b)	Two	

2.6 EXPENDITURES ASSOCIATED WITH SCIENTIFIC ACTIVITIES

a Total funds spent on scientific activities broken down into the following categories:

FUNCTIONS

	<u>62-63</u>	<u>63-64</u>	<u>64-65</u>	<u>65-66</u>	<u>66-67</u>	<u>67-68</u>
Intra Mural R & D.	150,992	161,804	190,465	294,695	274,545	329,770
Scientific Information	4,255	5,985	4,763	5,966	6,000	6,391
R & D in Universities	37,200	47,500	86,500	111,000	148,000	195,000
R & D in Other Agencies	22,800	22,500	33,500	34,000	82,000	85,000

SCIENTIFIC DISCIPLINE

	<u>62-63</u>	<u>63-64</u>	<u>64-65</u>	<u>65-66</u>	<u>66-67</u>	<u>67-68</u>
Social Science	155,247	167,789	132,183	224,916	189,428	241,206
Natural Science	--	--	63,045	75,745	91,117	94,955
Grants (Social- Natural and Physical Science)	60,000	70,000	120,000	145,000	230,000	280,000

<u>(b) OPERATING AND CAPITAL FUNDS EXPENDED</u>						
	<u>62-63</u>	<u>63-64</u>	<u>64-65</u>	<u>65-66</u>	<u>66-67</u>	<u>67-68</u>
Operating	208,470	225,118	300,503	431,991	499,682	606,339
Capital	6,777	12,671	14,725	13,670	10,863	9,822

<u>(c) FUNDS EXPENDED TO FURTHER PROFESSIONAL UNIVERSITY EDUCATION</u>						
	<u>62-63</u>	<u>63-64</u>	<u>64-65</u>	<u>65-66</u>	<u>66-67</u>	
	--	--	4,874	--	--	80

2.7 Research Policies

- a) Units concerned with intra-mural research activities
- 1) Research Projects are initiated as a result of needs expressed by operational agencies within the department, and of proposals put forward by the research agency in response. Problems are defined by discussions between senior officials of the department and members of the research group.
Other government agencies which have northern research interests are kept advised of our program through meetings of committees such as the Scientific Research Sub-Committee of the Advisory Committee on Northern Development, and through less formal exchanges of information between individuals in several departments with related interests.
 - 2) Priorities between programs and projects are established at the annual Program and Estimate Reviews with the Executive Committee of the department, and are implemented in accordance with the availability of professional staff and funds.
 - 3) A Program Evaluation Unit has been organized in this department, as a central service agency, and it will assess the Group's research program together with other departmental programs.
 - 4) The Northern Science Research Group depends in large part on contractual agreements with university scientists for the conduct of individual research studies. Members of the small staff of permanent research personnel in the Group Act in many instances as co-ordinators and research administrators. A case in point is the Mackenzie Delta Research Project, a multi-disciplinary study designed to investigate the problems faced by native people in a changing environment. In 1965, when preliminary investigation began, four studies were made under contractual agreement with university scientists:
 - i) A basic guide to the economic geography of the Mackenzie Delta.
 - ii) A description and analysis of the technology of the area.
 - iii) An outline of subsistence patterns in the delta.
 - iv) A preliminary analysis of social structure of the new town of Inuvik.

II. 2.7

- 5) Reference has already been made to the program of grants to universities within the Northern Science Research Group administers. Grants are made to Institutes or presidential Committees for Northern Studies at twelve universities across Canada, as well as to the Arctic Institute, and to three scientific expeditions. The Grants program was initiated on the recommendation of the Scientific Research Sub-Committee of the Advisory Committee on Northern Development. Its principal objective is to stimulate research on problems of the north in all disciplines, particularly at the graduate level, with a view to encouraging the professional development of more scientists with a special knowledge of the north and a commitment to northern research. The allocation of funds to each of these Institutions or Committees has been based on the recommendations of a Grants Committee for Northern Research appointed by the Minister. The Grants Committee is made up of six senior scientists, of whom three are from government and three are from universities. The recommendations of the Grants Committee are based on a study of the proposed programs of research supplied by applicants. Recipients use the grants to support research in the whole field of the sciences, and the funds awarded are administered by the business offices of the universities. Reports of the previous year's work are also presented by applicants, and are used as a guides in recommending awards. The allocation of funds to individual scientists at the universities is controlled internally by each of the university committees or institutes.
- 6) Decision to shift research resources from one program to another is made by the Executive Committee of the department.
- 7) Research results are communicated principally through the publication of reports. In the case of intra-mural research, reports are widely distributed to Canadian universities and to other agencies in all parts of the world which have special interests in northern research.

b) Units exclusively concerned with extra-mural research activities.

Not applicable.

2.8 Research Output

1) Not applicable.

2) Publications by extramural agencies of research conducted for the Northern Science Research Group.

- | | | |
|----|-----------------------------|---|
| a. | Jenness, Diamond | Eskimo Administration: I. Alaska
Montreal; Arctic Institute of North
America, Technical Paper No. 10, 1964. |
| b. | Jenness, Diamond | Eskimo Administration: II. Canada
Montreal; Arctic Institute of North
America, Technical Paper No. 14, 1964. |
| c. | Honigmann, John and
Irma | Eskimo Townsmen
Ottawa; Canadian Research Centre for
Anthropology, University of Ottawa, 1965. |
| d. | Jenness, Diamond | Eskimo Administration: III. Labrador
Montreal; Arctic Institute of North
America, Technical Paper No. 16, 1965. |
| e. | Slobodin, Richard | Metis of the Mackenzie District
Ottawa; Canadian Research Centre for
Anthropology, Saint-Paul University, 1966. |
| f. | Jenness, Diamond | Eskimo Administration: IV. Greenland
Montreal; Arctic Institute of North
America, Technical Paper No. 19, 1967. |
| g. | Jenness, Diamond | Eskimo Administration: V. Analysis
and Reflections. Montreal; Arctic
Institute of North America, Technical
Paper No. 21, 1968. |

3) Publications by the Northern Science Research Group1962

- | | |
|------------------|---|
| Honigmann, J.J. | Foodways in a Muskeg Community - NCRC-62-1 |
| Vallee, F.G. | Kabloona and Eskimo in the Central
Keewatin, NCRC-62-2 |
| Cohen, Ronald | An Anthropological Survey of the
Communities in the Mackenzie-Slave
Lake Region of Canada. NCRC-62-3 |
| Clairmont, D.N. | Notes on the Drinking Behaviour of the
Eskimos and Indians in the Aklavik
Area. NCRC-62-4 |
| Hurlbert, Janice | Age as a Factor in the Social Organization
of the Hare Indian of Fort Good Hope,
N.W.T. NCRC-62-5 |
| Dunbar, M.J. | Second Report on the Bering Strait
Dam NCRC-62-6 |
| Johnson, M.D. | An Exploratory Study of Ethnic Relations
at Great Whale River. (A revised and
expanded version of NCRC-61-5). |
| Vallee, F.G. | Sociological Research in the Arctic
NCRC-62-8 |

1963

- Lotz, J.R. Government Research and Surveys in the Canadian North, 1956-61 Ed., NCRC-63-1
- Graburn, N.H.H. A General Introduction to Lake Harbour, Baffin Island. NCRC-63-2
- Balikci, Asen Vunta Kutchin Social Change NCRC-63-3
- Van Stone, James The Snowdrift Chipewyan NCRC-63-4
- Parker, V.J. The Planned Non-Permanent Community NCRC-63-5
- Yatsushiro, Teshio Frobisher Bay 1958 (restricted for Departmental use only) NCRC-63-6
- Smith, G.W. Territorial Sovereignty in the Canadian North NCRC-63-7
- Bourne, L.S. Yellowknife, N.W.T. A study of its Urban and Regional Community NCRC-63-8
- Clairmont, D.H.J. Deviance Among Indians and Eskimos in Aklavik, N.W.T. NCRC-63-9
- Jenness, R.A. Great Slave Lake Fishing Industry NCRC-63-10

1964

- Graburn, N.H. Takamiut Eskimo Kinship Terminology NCRC-64-1
- Lotz, J.R. Yukon Bibliography
- Lotz, J.R. The Dawson Area
- Parsons, G.F. Yukon Travel Survey 1963

1965

- Sye, Hiroko Pre-School Children of the Hare Indians NCRC-65-1
- Usher, Peter J. Economic Basis and Resource Use of the Coppermine-Holman Region, N.W.T. NCRC-65-2
- Cooper, P.F., Jr. Air-Cushion Vehicles in the Canadian North NCRC-65-3
- Lotz, J.R. The Chilkoot Trail Today - Dyea to Bennet

Special Committee

1966

- | | |
|-----------------|---|
| Arbess, Saul E. | Social Change and the Eskimo Co-operative at George River, Quebec.
NCRC-66-1 |
| | Social Science Research Abstracts, 1959-1965.
NCRC-66-2 |
| Turner, Adrian | Trappers, Hunters and Fishermen - Wildlife Utilization in the Yukon Territory. |

1967

- | | |
|-------------------|--|
| Hill, R.M. | Mackenzie Reindeer Operations
NCRC-67-1 |
| Vallee, Frank G. | Povungnituk and It's Co-operative. A Case Study in Community Change
NCRC-67-2 |
| Wolforth, John R. | The Mackenzie Delta - Its Economic Base and Development
MDRP-1 |
| Cooper, P.F., Jr. | The Mackenzie Delta - Technology
MDRP-2 |
| Smith, D.G. | The Mackenzie Delta - Domestic Economy of the Native Peoples
MDRP-3 |
| Mailhot, J. | Inuvik Community Structure - Summer 1965
MDRP-4 |
| Ervin, A.M. | New Northern Townsmen in Inuvik
MDRP-5 |

4) Conferences or Other Means used to transfer information
1962-63

- Arctic Institute Conference on Recent Anthropological Research in the Arctic and Sub-Arctic - Montreal, P.Q.
- Annual Conference of Canadian Association of Geographers, McMaster University, Hamilton - 1962.
- Meetings of the Advisory Committee on Northern Development, and its Sub-Committees. The purpose of this Committee is to advise the government on questions of policy relating to civilian and military undertakings in Northern Canada, and to provide for the effective co-ordinations of all government activities in that area.
- Canadian Conference on Social Work - Winnipeg, Man. June 4-8, 1962.
- Various reports as listed in 2.8 (3).

1963-64

- Meetings of the Advisory Committee on Northern Development, and its Sub-Committee - Ottawa.
- Various reports as listed in 2.8 (3).

1964-65

- Alaskan Science Conference - Fairbanks, Alaska.
- American Anthropological Association Conference, Detroit, Mich.
- Canadian Political Science Association Conference - Hamilton, Ont. Conference on community development.
- Centre for Community Studies - University of Saskatchewan.
- Indian Eskimo Association Conference - Toronto.
- Meetings of the A.C.N.D. and its Sub-Committees - Ottawa.
- Various reports as listed in 2.8 (3).

1965-66

- Alaska Science Conference - Whitehorse, Y.T.
- American Anthropological Association Conference - Denver, Col.
- American Association of the Advancement of Science - Montreal, P.Q.
- Meetings of the A.C.N.D. and its Sub-Committees - Ottawa.
- Various reports as listed in 2.8 (3).

1966-67

- Northeastern Anthropological Association Conference - Montreal, P.Q.
- American Anthropological Association Conference - Pittsburg, Pa.
- Conference on Intermediate Technology - St. John's, Nfld. Memorial University.
- Indian Eskimo Association Conference - Winnipeg, Man.
- McGill Conference of Social Research in the North, Montreal, P.Q.
- Meetings of A.C.N.D. and its Sub-Committees - Ottawa.

- 5) This research agency shares access to information from abroad with a variety of institutes for northern studies and other such organizations, and has no exclusive channels to such data. Members of these institutes as well as other persons with northern interests share such data in publications, conferences, visits, and informal contacts.

II. 2.8

- 6) The Grants Program has as its principal objective to encourage the training of scientists for northern work. In addition, in-house research undertaken over the past five years has utilized the services of 12 to 14 graduate students who have had an opportunity to train themselves in the fields of anthropology, sociology, and other social sciences, and they have gone on to occupy research and teaching positions in government and the universities.
- 7) Several research projects involving a team approach have been initiated since 1962. They have not yet, however, become thoroughly integrated as inter-disciplinary units. Almost all members of these teams have teaching responsibilities during the academic year, and act as research team members during the summer only. Although development of such research teams is thus a slow process, they promise to be very effective in the investigation and analysis of many problem areas.
- 8) The Inuvik Scientific Research Laboratory, which opened in 1964 at Inuvik, N.W.T., was established by this department as a means for encouraging and facilitating research in the north. The Laboratory facilities are open to scientists from the universities, government, and industry: general laboratory and office accommodation, some technological assistance, and basic field camp equipment are provided. Special facilities include an annex for cosmic ray measurement, low temperature rooms, a photographic darkroom, and a seminar room. The manager and a small technical staff provide assistance and support to scientific investigators throughout the year.
- 9) It will be noted that the Northern Science Research Group has two separate and distinct areas of responsibility. Firstly, it encourages and facilitates northern research in all branches of science through the Grants Program and the Scientific Research Laboratory in Inuvik. Secondly, it conducts a small in-house research program, mainly in the social sciences, directed toward problems related to the adaptation of the native peoples of the north to a changing environment. This in-house research uses the data-gathering techniques and the analytical tools of the social sciences in order to add new dimensions to understanding social problems.

2.9 Projects for which the Northern Science Research Group was responsible.

1962-63

- A socio-economic survey of the Wakeham Bay Eskimo - Wakeham Bay, P.Q.
- A study of Air Photo Interpretation in Labrador-Ungava.
- A comparative study of the administration of Eskimos in Canada, Alaska and Greenland.
- A sociological study of the Resolute Bay Eskimo Group.
- A socio-economic study of the community of Makkovik, Labrador.
- A study of the living conditions and welfare problems of Indians and Metis at Fort Good Hope, N.W.T.
- A study of the use of alcoholic beverages among Eskimo, Metis, Indians in Inuvik, N.W.T.
- A socio-economic survey of settlements on the Mackenzie.
- A study of the adaptation of selected Eskimos to life in Southern Canada - Ottawa, Frobisher Bay.
- Initiation of a socio-economic study of the Metis of the Mackenzie Valley.
- Initiation of a study of co-operatives in the Eastern Arctic - Frobisher Bay, Povungnituk, Cape Dorset, Fort Chimo.
- A sociological study of Yellowknife, N.W.T.
- Completion for publication of a report on "Canada's Expansion to the Arctic and Related Problems of Sovereignty" - Ottawa.
- Initiation of a community study of Frobisher Bay - NWT.

1963-64

- A socio-economic study of the Gjoa Haven - Back River Eskimos.
- A sociological study of Whitehorse community, Yukon.
- A social and psychological study of Eskimo residential school children - Mackenzie Delta Area.
- Completion of the community study of Frobisher Bay.
- Continuation of a comparative study of the administration of Eskimos in Northern Canada, Alaska, Greenland and Labrador.
- A study of dietary habits of residents of the Canadian North.

Special Committee

- A study of economic, social and demographic change among the Eskimos of the southern side of Hudson Strait.
- A socio-economic study of the community of Dawson, Y.T.
- A preliminary study of the tourist industry of the Yukon Territory - Whitehorse.
- A linguistic study of Greenland Eskimo.
- Completion of a social and economic study of the Metis of the Mackenzie valley.
- Completion of a study of co-operatives in the Eastern Arctic - Frobisher Bay, Povungnituk, Cape Dorset, Fort Chimo.

1964-65

- A study of the development of the Eskimo co-operative at George River, P.Q.
- Continuation of a comparative study of the administration of Eskimos in Northern Canada, Alaska, Labrador and Greenland.
- A study of the economic, social and demographic change among the Eskimos of the southern side of Hudson Strait.
- A study of the development of the Yukon Government.
- A study of the child-raising practices of the Eskimos living in the Clyde River Area in the N.W.T.
- A socio-economic study of hunters, trappers and fisherman in the Yukon Territory.
- A comparative study of the potential usefulness of air cushion vehicles in Northern transportation - Ottawa.

1965-66

- A biological study of sled dogs and their management in the Eastern Arctic.
- A sociological study of the community of Inuvik, N.W.T.
- A study of the domestic economy of the native people of the Mackenzie Delta.
- A study of the economic geography of the Mackenzie Delta.
- A comparative study of the educational arrangements for native peoples in Arctic Canada, Alaska and Greenland.
- A continuation of the 1964 study of social and economic change in the Eskimo community of George River, P.Q.
- Continuation of the comparative study of the administration of Eskimos in Northern Canada, Alaska, Labrador, and Greenland.
- A study of technology in the Mackenzie Delta.

- A comparative psychological study of two groups of Eskimos living at Baker Lake and in the Ottawa area,
- A continuation of the 1964 study of the child-raising practices of the Eskimos living in the Clyde River, N.W.T. area.
- A continuation of the 1964 study on Canada's expansion to the north and related problems of sovereignty - Ottawa.

1966-67

- A study to determine significant components of town planning in Mackenzie Delta.
- Sociological study of the non-transient population of Inuvik, N.W.T.
- Continuation of the study of sled dogs management in the Eastern Arctic.
- Continuation of the comparative study of Eskimo Administration in Northern Canada, Alaska, Greenland and Labrador.
- A psychological-anthropological study of motivation, values and behaviour determinants among native people in the Mackenzie Delta.
- A study of the socio-economic determinants of population change in the Mackenzie Delta.
- Study of sea-ice movement in Kugmallik Bay, N.W.T.
- Preparation of a bibliography of articles and books dealing with the Mackenzie Delta.

1967-68

- A study of problems of Eskimo relocation for industrial employment.
- A study of Mackenzie Reindeer Project Operations.
- An engineering study of utilidors in northern settlements.
- A study of the attitude of white transients in Inuvik toward the native peoples of the area.

d)

	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73
B.A.	1	1	-	-	1	1	1	-	-	-	-
M.A.	3	4	5	4	6	8	9	8	9	10	12
PhD.	2	-	-	-	-	-	-	3	4	4	4

Note:- In addition a number of research staff up to the PhD. level are employed in seasonal positions.

e)

	62	63	64	65	66	67
B.A.	-	-	20%	-	-	-
M.A.	-	-	-	14%	-	-
PhD.	20%	-	-	-	-	-

- f) See table
- g) Not applicable
- h) Two students

THE MACKENZIE DELTA RESEARCH PROJECTA PROGRESS REPORTBackground

The Mackenzie Delta Research Project was initiated in the spring of 1965. For the previous ten years the Northern Co-ordination and Research Centre had carried out a program of research in the social sciences among northern people. The majority of the research projects undertaken during this period consisted of studies in single communities, conducted mainly during the summer months by scientists from universities employed either seasonally or under contract. The data that were collected covered conditions over a wide geographical area, and varied in depth. A large amount of information was collected and published, but of necessity the approach to research during this time was "piecemeal", largely owing to the scarcity of qualified investigators interested in the North. Since the available scientists were inevitably connected with universities, a compromise between government and academic interests was necessary. However, over the decade a group of well-trained social scientists with research experience in the north was developed, largely through Northern Co-ordination and Research Centre support.

In 1965, it was decided that it would be possible to undertake a research program drawing from a number of scientific disciplines to investigate in depth the problems besetting the people living in a defined geographical area. The area chosen for the first of these "in depth" investigations was the Mackenzie Delta. The reasons for this selection were the variety of social and other environmental elements to be found there. They were considered to be broadly representative of conditions in the Northwest Territories. The availability of a good operations base in the field - the Inuvik Research Laboratory - was an additional argument in favour of this area. A Research Co-ordinator was appointed and the project got under way in April, 1965.

Objectives & Procedures

The project was planned to focus research on those problems of the native peoples which inhibit them from participating in northern development, and to assess the extent to which they are making effective adjustment to the cultural and economic changes that have been brought about by commercial and government expansion in the north. Suggestions about

possible directions which research might take in an attempt to provide useful analyses of the situation were requested from government and other agencies operating in the Delta. These included agencies within the Northern Administration Branch, as well as the Indian Affairs Branch, the Department of National Health and Welfare, the Royal Canadian Mounted Police, the churches, the Hudson's Bay Company, and the Northern Transportation Company. The Commissioner of the Northwest Territories was also consulted.

To attain these research objectives it was recognized that the approach would have to be from several different directions; using the expertise and techniques of several disciplines. Insofar as proved possible and practical, it was planned to develop a team of specialists whose work would be mutually complementary.

The First Phase

Four studies were undertaken through contractual arrangements in the summer of 1965.

1. Reliable and reasonably comprehensive information about the current economic situation in the Delta was not available. In order to provide members of the research team with a basic understanding of the economy, a study which would provide an "outline map" of the economy was undertaken. This was not planned to be a detailed and intensive analysis, but was intended rather as a guide to other researchers when they came to consider future possibilities for the native people of the area.
2. The second study undertaken in Phase I was an analysis of the social structure of Inuvik. Studies of fur trade settlements in the north already provided a basic framework for understanding the structure of the smaller communities in the Mackenzie Delta, but the new town of Inuvik was unique and required special attention.
3. Previous research in the Delta, by Clairmont and others, had indicated that one of the most serious human problems could be seen in terms of the greater speed at which native people were learning new needs, than that at which they were acquiring the means to satisfy them. A preliminary investigation structured along these lines was initiated.

4. To provide a sound understanding of the present, as well as a limited basis for projecting the future, a fourth study was directed toward the technology of the area. Technology was seen as one of several influences which determine present and future development, and this research was a necessary component of the background studies.

After suitable investigators were found to undertake them, these studies were carried out during the summer of 1965. Preliminary reports of field work were submitted toward the end of that year and a research conference was held on 28 February and 1 March, 1966, in Centennial Tower. Several anthropologists with extensive northern experience, together with representatives from operational agencies within the Department of Indian Affairs and Northern Development, as well as representatives from other government agencies including the Department of National Health and Welfare and the Department of Citizenship and Immigration (Indian Affairs Branch), met with the principal researchers to discuss the work that had been done, and the directions future research should take.

The Second Phase 1966-67

The report on the community structure of Inuvik revealed the presence of what were, in many respects, not one but two communities.

5. The first community was in the unserviced area, and consisted of the native people, together with some other permanent residents. The second was in the serviced area of government housing, and was composed almost exclusively of transient members of Federal Government agencies. Since the basic concern of the Mackenzie Delta Research Project was with the adaptation of the native people in the area, further investigation of the social structure in the "unserviced area" was indicated. Preliminary investigation had revealed that the community lacked cohesion, and a study was now directed toward providing some understanding of this.
6. It was also apparent that a good many of the attitudes, and a good deal of the behaviour of people who lived in the unserviced area, could be understood as responses to some of the attitudes and actions of the transients in the serviced area. The attitudes of these transients

toward the problems of the native people were therefore investigated.

7. Also, with the data already available at this time, it could be seen that many of the problems accompanying the change in life-style from living in the bush to living in the relatively urban environment of Inuvik, had important psychological components which it would be necessary to investigate if some important areas of behaviour were to be understood. Included here was the need to identify socio-cultural elements generating psychological disturbance. To collect and analyze data in this category, a study was undertaken by a psychiatrist, who had had previous research experience with other Eskimos.
8. The need for a detailed study of the changing human ecology of the Delta area became apparent. The impact of the fur trade, followed by missionary activity, the arrival of the whalers, and the introduction of government agencies, could all be seen as developments bearing upon ecological change. Only a small amount of the potentially available data related to this subject was readily available, and it was recognized that a search among original sources in archives and similar places would be necessary, as well as recovery of data which could be obtained from interviewing people.
9. Finally, vital information was demonstrably deficient in one other research area. Although a considerable amount of information about the behavior, the ideas, the attitudes, and the life-ways of the native people of the Delta was available, almost all had been observed from the vantage point of the administrator, the teacher, the social worker, the nurse, or the policeman. But much of what the native people did, said, and felt was not open to observation by government agents, who were usually allowed to become aware of only what was deemed appropriate for them to know. In order to understand what native people regarded as the real and legitimate choices when they made decisions to follow a course of action, it was necessary to know what they themselves

listed as the options, and how they weighted them. This information could be obtained only by a researcher who would not be viewed as a government functionary, but as one whose role was not in any degree seen to involve a directive or instrumental capacity. It would be necessary for this investigator to live as close to them as possible, for a period sufficiently long that he could gain their trust and confidence in his non-manipulative interest in them, as well as in his personal regard for them as people. A continuous year of field work was regarded as the minimum time from which useful analysis could emerge. A suitable anthropologist with sufficient training and experience was available, and he began field work at the end of the summer.

Two other undertakings having a slightly different significance in the project were initiated.

10. All the project researchers had been collecting lists of original bibliographic sources and, to avoid duplication of effort, it was planned to consolidate these. When this was done, it was noted that some bibliographic resources had not been explored, and it was decided to produce a modest area bibliography which would be a useful working tool. For reasons of economy and practicality it will not be a comprehensive listing of every obscure source.
11. A study of town planning in the north was initiated at the request of the northern Town Planner, whose duties as an official of the northern administration included responsibility for drawing up plans for northern communities. In supporting this request, the Town Planner explained that he felt urgent need for assistance in the development of techniques which would enable him to meet the special requirements of planning for northern communities. Stating that he was now compelled to plan northern communities on the basis of experience gained in the south, where many quite different sets of conditions obtained, he supported the application of a team of two graduate students in Planning who wished to undertake a research project and whose objective was to develop a planning

methodology suitable for the north. The methodology which they proposed to develop would be based upon local human needs and considerations, as well as upon physical and engineering constraints. Because of the volume of data dealing with the people of the area which would be available as a result of other research being done in the Delta, they wished to undertake the study there, and to work with the other researchers. Their field work began in May, 1966.

Following the end of the summer field work period in 1966, a second conference was held on 6 December. Invitations to attend were extended to agencies in the department, including Northern Administration Branch, Indian Affairs Branch, Resources and Economic Development Group, and Canadian Wildlife Service, and to the Commissioner of the Northwest Territories. Preliminary reports of the field work of the previous summer were presented by the investigators, and the findings were discussed.

Although preliminary reports of field work were available at this time, preparation of final reports was delayed. After a season of data-collecting in the field, investigators returned to their university posts and immediately had to involve themselves completely in the preparation of the lecture courses they were to present in the academic year which was about to begin. The analysis of the data collected in the field and its presentation in final form were inevitably delayed. To compound this delay on 1 April, 1967, the Co-ordinator of the project assumed new responsibilities and had less time to devote to the project. The original research plan called for implementation of Phase 3 of the project beginning in the spring of 1967, but it was necessary to delay this until a suitable person could be found to assume specific responsibility for it.

The Third Phase

Emphasis in the final phase of the program will be on feedback to potential users of the findings of the research. Three categories of potential users are considered here:

1. Employees of the Federal and Territorial Governments in policy-making and in operational roles. Feedback to

People in this category can be accomplished, it is hoped, through written reports, formal and informal conferences, and frequent consultation.

2. People of the Mackenzie Delta. Since the residents of the area have themselves the capability of making many decisions about their future, they are also considered to be potential users of research findings, which can provide them with an improved understanding of the choices open to them. However, the communication of such findings to a group with such a wide range of literacy poses a problem. Techniques to accomplish this will be exploratory, and it is proposed to undertake this task in co-operation with adult educators in the department. Devices which will be tested for their effectiveness will include specially prepared printed materials and radio broadcasts. In preliminary discussions, the CBC has expressed a willingness to co-operate in such an undertaking both in the field and at headquarters. Another possible feedback device being considered is to hold short residential workshop courses, where a limited number of native opinion-leaders can meet with the researchers and educators.
3. Professional colleagues. They can be kept informed by publication of reports.

A suitable scientist has now been engaged to undertake the duties of Co-ordinator of the project and to assume responsibility for implementation of the third phase. He will begin in the early summer of 1968.

Publications

The publication status of reports, (which correlate with Items 1-11 in the preceding text,) is as follows:

- | | | | |
|----|------------------|--|----------|
| 1. | John R. Wolforth | The Mackenzie Delta - Its Economic Base and Development - A Preliminary Study. | In Print |
| 2. | Jose Mailhot | Community Structure - Inuvik, Summer 1965. | In Print |
| 3. | Derek Smith | Mackenzie Delta - Domestic Economy of the Native People. | In Print |
| 4. | P.F. Cooper Jr. | Mackenzie Delta - Technology. | In Print |
| 5. | A.M. Ervin | New Northern Townsman in Inuvik. | In Print |

6.	G.F. Parsons	Attitudes of Inuvik Transient Residents: A Survey	Final draft in prepar- ation
7.	J.M. Lubart	Psycho-dynamic Problems of Adaptation - Mackenzie Delta Eskimos - A Preliminary Clinical Study.	Final draft in prepar- ation
8.	John Wolforth	The Mackenzie Delta: Changes in Human Ecology.	Draft in preparation
9.	Derek Smith	The Mackenzie Delta: A Plural Community.	Draft in preparation
10.		Mackenzie Delta Bibliography.	Near completion
11.	C. Aasen and W. Wright	Comprehensive Settlement Planning in the Mackenzie Delta, N.W.T.: A Proposed Planning Theory and Methodology.	Final draft in prepar-

Following publication of the reports of individual sectors of research listed above, it is planned to produce a compendium in two parts. The first part will present and relate the principal scientific results of all the studies. The second part will be directed towards the needs of northern administrators and policy-makers and will relate the results to specific government programs, including Welfare, Education, Vocational Training and Local Government.

Subsequent studies will be directed towards evaluating the impact of the recommendations that result from the project, and towards assessing the predictive value of the research.

2.5.c CHART I NSRG

B.A.'s and M.A.'s employed in Northern Science Research Group,
Department of Indian Affairs and Northern Development, by
country of birth and country of training.

Data include research staff only.

Country of Training	Country of Birth	B.A.		M.A.			Netherlands
		U.S.A.	England	Canada	Scotland	U.S.A.	
Secondary Schooling							
U.S.A.		1		1		1	
Canada				4	1		
England			1				
Netherlands							1
B.A.							
U.S.A.		1				1	
Canada				5	1		1
England			1				
M.A.							
England			1				
Canada				4			
U.S.A.				1	1	1	1
Able to operate effectively in both languages		-	1	1	-	-	-

BRIEF
TO
SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
Indian Affairs Branch
December 1968

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
 Department of Indian Affairs and Northern Development
Indian Affairs Branch

II 2.2 Organizational Functions

- a Indian Affairs Branch has no statutory functions and powers regarding scientific activities.
- b The Branch does not have a research grants program, but seeks research assistance by means of contracts on an ad hoc basis. Initiative arises largely from the Branch. Indicators are that this is changing and more suggestions will be received from academic sources. These are reviewed by a research committee which reports to the Director of Policy and Planning. The Branch sees a need for studies on a project basis dealing with subjects selected by an advisory committee, and possibly conducted by departmental employees on educational leave. Activities in the past have been limited because of the lack of a firm program. A new policy on research is being introduced which will give focus to our scientific activities.

 All funds for Research, as such, have been placed in the Policy and Planning Directorate at Headquarters, while leaving to other Directorates and to the Regions the responsibility of financing and planning for Surveys, and Feasibility Studies. The Policy will include coordination of planning for Research and Studies, leaving opportunity for every level of Branch Staff and Indian communities to exercise initiative in indicating matters that require further study.
- c
 - (i) To cooperate with other Federal Agencies in matters of Research. Such Agencies include:
 - Dominion Bureau of Statistics
 - Manpower and Immigration
 - Secretary of State
 - Forestry and Rural Development
 - Central Mortgage and Housing
 - National Health and Welfare
 - (ii) To cooperate with industry in making studies with a view to development of economic opportunity and in making use of the natural, physical and human resources of the Reserves for the benefit of the Indian Peoples.
 - (iii) To cooperate closely with universities in using their Research and Scientific expertise pertinent to Indian development, having in mind the capacity of a particular University or group of universities to carry out the Research or Studies required.
 - (iv) To use information already gathered by universities in Research and Development.
 - (v) Private Consultant firms are used from time to time particularly for surveys and feasibility studies.
- d A Branch Research Committee has recently been appointed to assess all needs for Research and Studies, to make recommendations to the Policy and Planning Director for the undertaking of same, and to review the reports

and results. The Committee has, in its membership, representatives from all Directorates in the Branch. The factors that might be considered as influencing whether or not research and studies are undertaken:

- (i) The size of the Indian population thus determining the number and extensiveness or intensiveness of certain problems.
- (ii) The mobility of Indians off Reserve.
- (iii) The resource potential of some Reserves.
- (iv) The relationships existing between Indians and non-Indians.
- (v) The availability of funds.

e Nil.

f The Branch's responsibilities and powers are derived from the Indian Act and the Appropriation Act and its program is to ensure that Indians have the opportunity to realize their full human potential within the Canadian Society.

g The major hindrance to scientific activities past and present has been inadequate provision of funds and staff. This has partly been because of the lack of coordinated effort and concentration on a definite Research program. The Policy and Planning Directorate will resolve these two factors but the third -- funds -- is dependent on overall Government attitude and policy. The coordination, as indicated, will be external as well as internal. Increased public awareness of Indians will change the initiative for these activities from the Branch to outside individuals and agencies thus adding more varied insight into these matters:

One other hindrance is related to the difficulty of obtaining statistical information from other Departments, because different coding methods are used for data storage. This is now being overcome. The other is the law, which does not permit information to be obtained relative to ethnic origin. This makes it difficult to obtain data relevant to Indian people to use as comparison with the Canadian Society as a whole. It is impossible, because of the Income Tax Regulations, to obtain income data relative to Indians who obtain their work on Reserves, because income earned on reserves is tax exempt.

2.3 Personnel Policies

- a No steps have been taken to identify and hire members of university graduating classes as researchers.
- b No criteria have been developed to identify creative and effective researchers.
- c No steps have been taken to identify staff members with high potentiality as research administrators.
- d N/A. The Branch has not been involved in intramural research.
- e Extramural Research is contracted for and financed by the Policy and Planning Directorate on the recommendation of the Branch Research Committee. Various other types of studies as previously mentioned may be contracted for from time to time by various

Special Committee

Branch Officers including those in the field, within the appropriate signing authorities.

2.4 Distribution of Activities

- a Regional pattern of spending (Extramural) 1968-69 (Estimated)

Yukon	\$3,700
British Columbia	7,635
Alberta	86,000
Saskatchewan	18,000
Manitoba	49,464
Ontario	25,500
Quebec	56,400
Maritimes	3,000

- b The natural and physical resources may indicate suitability of certain regions for specific projects (salt water fishing in British Columbia and the Maritimes) but those studies related to the human resource are usually applicable across the country. Exceptions arise in smaller studies directly applicable to some local problem.
- c N/A
- d The general development work both social and economic of the Department has made some contribution to regional development in so far as the Indian population is concerned. It would appear, however, that much regional development has by-passed the Indian people. The Branch must play a continuing role of liaison with Indians and agencies both Government and private, and through its own programs and projects to eliminate any gap and allow the Indians to participate fully of this development.

2.5 Personnel Associated with Scientific Activities

- a Scientific activities, as already indicated, have proceeded on an ad hoc basis with various officers from time to time involved. The only part of the Branch responsible for research is the recently constituted Policy and Planning Directorate. However, over the 2 years of its existence, the freeze and establishment cuts have resulted in no special recruitment of staff to fulfill this responsibility. As a result, this responsibility has been shared by some of the other officers; three officers are professionals while one, the administrator, is not. Regional and other staff at headquarters, as already described, have occasional input only and not on a regular basis.

There are 4 others in the Directorate in addition to those mentioned above. These are not involved in research. This brings to 8 the total personnel in the unit including stenographic help.

- b There are no professional staff devoting most of their time to the administration of research.

c Country of birth Canada

Secondary education	3
University Bachelor	3
Master	2
Doctorate	0

	<u>#1</u>	<u>#2</u>	<u>#3</u>
No. working years since graduation.	<u>16</u>	19	24
No. years employed in I.A.N.D.	3	19	3
Age	38	51	52
Average Age	47		
Percentage to operate effectively in Canada's two official languages	33 1/3%		

d Professional Staff in Each Degree Category

Only the years 1966-1968 can be relevant since no
Policy and Planning Directorate existed before then.

	B.A.	M.A.	PhD.
1966-67	1	2	0
1967-68	1	2	0
1968-69	2	3	0

e Percentage of turnover 1966-67 - nil.

f Percentage Professional personnel in other areas of work.

(i) in Industry	33 1/3
(ii) Staff of Universities	
(iii) Provincial Departments or Agencies	
(iv) Other Federal Agencies	
(v) Other Agencies	66 2/3

g Number of educational leave - Nil

- 2.6 Functions - note a) that our research and development
is not intramural as defined.
b) 1968-69 figures include estimates
for work still to be done.

	<u>1966/67</u>	<u>1967/68</u>	<u>1968/69</u>
(1) Research and Development	\$235,386	\$257,027	\$261,519

Scientific Discipline

(1) Engineering and technology	117,003	60,745	112,100
(2) Natural Sciences			
(a) Agricultural	7,000	14,600	4,900
(3) Social Sciences			
(a) Anthropology	43,840	13,110	3,700
(c) Economics	45,599	159,885	115,635
(d) Political	2,239	1,896	
(f) Sociology	13,695	6,791	44,184

Areas of Application

(4)	Agriculture (including fisheries and forestry)	8,000	17,700	
(9)	Industry	16,056	43,637	56,900
(10)	Underdeveloped	131,503	95,275	166,600
(13)	Social	74,827	85,284	15,099
(14)	Educational		1,660	40,420
(15)	Administration		17,863	1,500

b Operating Funds only for Policy and Planning

1966-67	\$128,429
1967-68	132,573
1968-69	279,000 (estimate)

c Nil

2.7 Research Policies

a N/A

b Units Exclusively Concerned with Extramural Research Activities.

- 1) All scientific activities undertaken are related to the Indian Affairs Program of developing the natural, physical and human resources to achieve the objective of giving the Indian people equal opportunity. As previously indicated, these studies are carried out by various individuals and agencies under contract to the Department.

- (i) In each case their previous record of achievement is considered.
- (ii) The nature of the project is also related to the capabilities of the individual or agencies proposing to carry out the project.
- (iii) We do not make grants and only initiate contracts as the situation warrants.

- 2) In the past, it has been part of the estimates process to review broad proposals of managers which they set forth on what they see as their priorities. Once these have been approved, they can then be processed by the manager within his signing authority. Should the total funds required exceed his authority, his superior may become involved or, on some occasions, Treasury Board. In each of these instances of a higher authority being required, the priority can be altered.

In the future, all studies in the research area will be subject to approval of the Director of Policy and Planning. All other studies will proceed as above but on a post audit basis; they will be subject to the action of the Research Committee and the Director of Policy and Planning.

- 3) Projects are usually within the frame of the terms of reference. A Departmental representative, either with responsibility for the function involved or the area involved, acts in liaison with the contracted person or agency.

Results are evaluated by Departmental specialists in the light of the Department's objectives. This is done afterwards and criteria and units of measurement are not, as yet, set up beforehand. The action of the Research Committee and the Policy and Planning Directorates will effect coordination and initiate and develop evaluation methods.

- 4) Since the work is contracted for, the main resource required is money and priorities are determined as described in #2.
- 5) Network methods are not used in this report.
- 6) See #2.
- 7) The results are related to the programs of the Branch and, when applicable and feasible, are reflected in the services provided to the Indian people.
- 8) Percentage of funds available to the Branch to support scientific activities.

	Research only	Research and other studies
1966-67	.06%	.24%
1967-68	.06%	.21%
1968-69	.03%	.19%

- 9) Percentage of funds granted N/A (no grants). It should be noted, however, that during the past year Research studies totalling \$700,000 were turned down.

2.8 Research Output

This reply deals only with research as such and not feasibility studies and surveys.

- 1) Nil
- 2) Books or Journals arising from research activities:
 - (i) Indians and the Law. The Canadian Corrections Association. The Canadian Welfare Council, August 1967.
- 3) Reports issued by this unit:

There are many reports resulting from studies which are for internal use only. One study was published through the Queen's Printer.

 - (i) A survey of the Contemporary Indians of Canada. Parts I & II Editor, H.B. Hawthorn, Part I Oct 66 Part II Oct. 67. Published by Indian Affairs Branch.
- 4) The Indian Band Council is involved through meetings and through distribution of reports.
- 5) Nil.
- 6) Nil.
- 7) Nil.
- 8) Nil.
- 9) The limited scientific activities of this Branch are primarily affecting the programs of the Branch and the lives of the Indian people. The latter's overall development along with that of the Crown lands on which they live will have an increasing effect on the Canadian economy.

10) Nil

2.9 Projects

1) Already listed.

2) Basic Research

In early 1964, a contract was let to the University of British Columbia to have Dr. H.B. Hawthorn direct a "Study of the Contemporary Indians of Canada". This study reviews social, cultural, economic, political and educational problems of Indians in Canadian Society and of the integration of Indian communities into the provincial, municipal framework within which other communities operate. It cost \$240,000 and Part I of the report was issued in March, 1967. Part II is expected to be released by the end of 1968.

BRIEF

TO

SENATE COMMITTEE ON SCIENCE POLICY

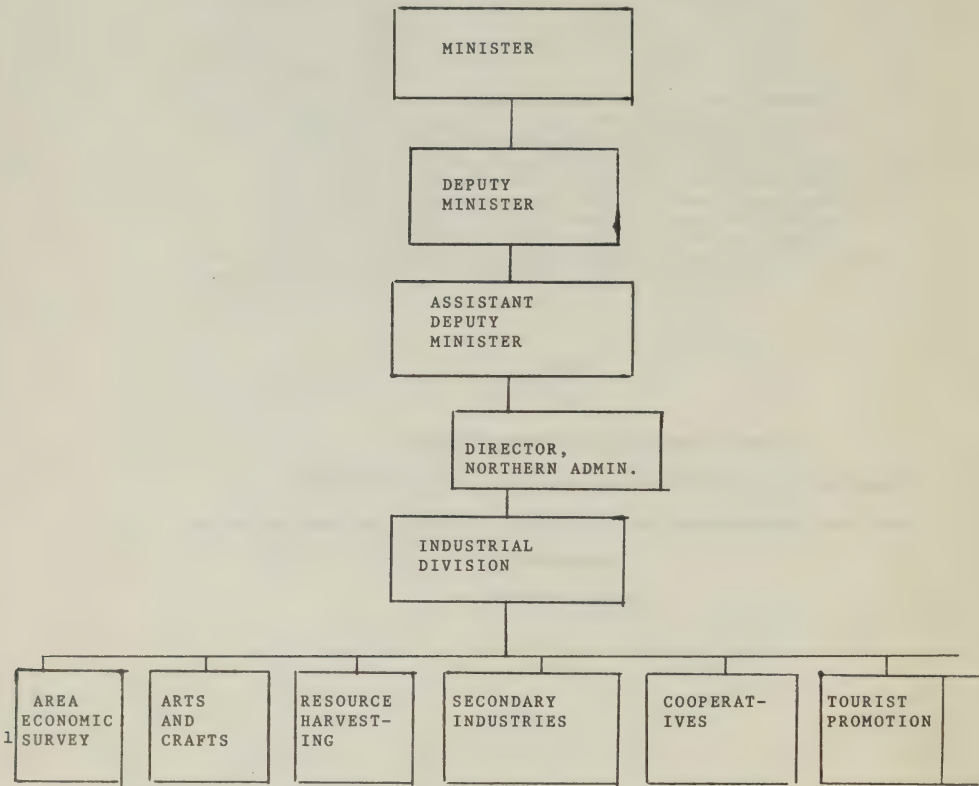
Department of Indian Affairs and Northern Development

Northern Administration (Including Area Surveys and Education
Division)

December 1968

2.1.c

Industrial Division, Northern Administration Branch



Area Economic Surveys section is responsible for doing research in economic geography in all northern regions.

1. *-Incidental Research*

PRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
Area Surveys

2.2 Organizational Functions

- (a) Area Surveys, a Section of the Industrial Division, Northern Administration Branch, Department of Indian Affairs and Northern Development, has no statutory powers regarding scientific activities.
- (b) The Section does not have a research grants program. Initiative arises from the Industrial Division. This Division is well aware of the various socio-economic problems associated with resource development and is responsible for projects designed to improve economic conditions in various sectors of the Northwest Territories. The original concept of area surveys arose out of the need for specific information on various areas and their resource potentials. Research by other agencies did not provide the requisite information.
- (c)
 - i) As a research unit, the Area Surveys Section is continuously involved in liaison with other Federal agencies. Field research is supplemented by the collection of data from Federal agencies operating in the survey areas. There is a mutual exchange of information and Area Survey reports are distributed to pertinent Federal Agencies.
 - ii) The Area Surveys Section staff frequently consults with private industry.
 - iii) Area Survey reports are supplied to educational and research institutions on a complimentary exchange basis.
 - iv) Area Survey research officers make use of information already gathered by universities.
 - v) Private consultant firms are not used in the program.
- (d) The reports are circulated within the Industrial Division and the Northern Administration Branch for a specific review and follow-up of recommendations contained in the reports. There is a limited amount of follow-up by research officers. The implementation of recommendations is undertaken by headquarters and regional staff.

2.3 Personnel Policies

- (a) Suitable personnel have been recruited through open civil service competitions. Research assistants for summer field work are contacted through universities.
- (b) The performance of research officers is subject to review from time to time.
- (c) The completion of research programs and the publications of reports are one of the major criteria as to the ability of staff members. Staff members with higher than average ability are asked to undertake surveys requiring particular competence.

- (d) The Head of the Section receives a larger salary in line with administrative functions vital to the research program.
- (e) Research officers are encouraged to continue with their education and apply for educational leave, if their educational goals fall within the normal spheres of research.

2.4 Distribution of Activities

- (a) The research program has been confined to the Northwest Territories.
- (b) Due to the large total area and the scattered nature of the settlements within the Northwest Territories, area surveys have been carried out in specific areas chosen on the basis of existing settlements, economic needs, and their current and potential resource utilization zones. Considerable attention has been paid to obtaining a complete coverage of the Northwest Territories.
- (c) The surveys completed during the past five years now form a valuable background for regional development.

2.5 Personnel Associated with Scientific Research

- (a) The current personnel establishment consists of the following:
 - 1. Three D.O.4's (one acting as Head of the unit)
 - 2. One employee hired on a temporary basis.
- (b) The Acting Head of the unit divides his time between administrative duties and completing an established research program.
- (c) i) Country of Birth: Canada (2); Yugoslavia (1); Indian (1).

ii) Secondary education	4	Canada (2), Yugoslavia (1),
		India (1)
Technical Training	1	Canada (1)
University Bachelor	3	Canada (3)
Masters	2	(one pending) Canada (2)
Doctorate	0	(two have commenced studies towards doctorates) associated with program

iv) Number of years employed	I.A.N.D.	#1	#2	#3	#4
		9	1½	1½	1½
v) Age		37	45	38	47

- (d) Professional staff in each degree category

	B.A.	M.A.	PhD.
1966-67	1	3	0
1967-68	1	2	
1968-69	1	3	

(f) Number of professional personnel

i) Employed by private industry	4
ii) On staff of universities	2
iii) Provincial Departments or agencies	2
iv) Other Federal agencies	2

(g) M.A. (1)

(h) Number of students given summer employment

<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
2	4	-	2	5	6	2

2.6 Expenditures Associated with Scientific Activities

(b) Operating and capital funds expended

<u>1966-67</u>	<u>1967-68*</u>	<u>1968-69</u>
49,250	83,610	86,670

*Increase due to expansion in program and staff increases.

Estimates 1968-69

<u>Program Cost*</u>	<u>Salaries</u>
\$ 40,170.00	\$46,500.00

*Program costs include salaries of field assistants, travel, equipment rental and supplies, and publication of reports for three large scale surveys.

2.7 Research Policies

The program is essentially directed towards economic development programs in the Northwest Territories and is designed to meet the requirements of the Industrial Division.

2.8 Research Output

Research output consists of detailed reports including statistical tables, graphs and maps. The content of each report is a detailed analysis of physical and human factors within a specified area. Basically the surveys are intended to:

1. Assess the renewable resources as to their ability to sustain the local population.
2. Determine the degree of exploitation of these resources and the efficiency of their use.

3. Investigate and explain the social and economic factors affecting resource utilization.

4. Recommend ways and means whereby the standard of living of the local people might be improved.

2.9 Projects

- | | |
|--|--|
| 1962 Southampton Island - | A report dealing with the Southampton Island and Repulse Bay areas. |
| 1962 The Tuktoyaktuk - | Cape Parry Report - This report dealt with the socio-economic conditions in the Tuktoyaktuk and Cape Parry areas and included recommendations for broadening the economic activities. |
| 1962 Western Ungava - | This report dealt with three Eskimo settlements along the west side of Ungava Bay and their respective resource area. Recommendations were made for an expansion of utilization of the resource base. |
| 1963 The Copper Eskimos - | This report covered the western sector of the central Arctic and covered six settlements and their resource areas. It provided vital information for the establishment of development projects. |
| 1963 The Keewatin Mainland- | The five main communities of the Keewatin District were included in this report. Specific recommendations were made in respect to the development of canneries for processing fish and sea mammals and the development of handicrafts. It was completed following the closing of a nickel mine and an economic depression. |
| 1963 The Yukon Territory
Littoral - | This report dealt specifically with the potentials for the development of a satellite community at Herschel Island to utilize the surrounding resource base. |
| 1965 Banks Island - | This report dealt specifically with Banks Island and the highly developed trapping economy existent on the island. |
| 1965 Northern Foxe Basin - | Northern Foxe Basin examined the socio-economic conditions existent in the Foxe Basin area and provided valuable information on the Igloodik Eskimos and their activities and the Baffin Land Iron Ore development. |
| 1966 The Lower Mackenzie
Region - | This study was a report on six communities in the Mackenzie Delta areas. The Mackenzie Delta |

with a large resident population and a varied resource base offers a major challenge in terms of economic development.

1966 East Coast Baffin
Island

- This study was carried out by a McGill University research team on contract as summer field assistants and examined the narrow economic base of the east coast of Baffin Island.

1967 South Coast of
Baffin Island

- This report assessed the potentials for further economic development of two communities, one with a well-established co-operative, the other with unexploited mica and soapstone resources.

1968-69 The following reports are being finalized for publication: Rae - Lac La Martre; South Shore of Great Slave Lake (at press); Central Mackenzie (at press); Frobisher Bay; Central Mackenzie; Keewatin Survey; Central Arctic; Fort Liard - Nahanni Butte.

2.5.c CHART I Area Surveys

B.A.'s and M.A.'s employed in Area Surveys Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Country of Training	Country of Birth	B.A.	M.A.	
		India	Canada	Yugoslavia
Secondary Schooling	India	1		
	Canada		1	
	Yugoslavia			1
B.A.				
Canada		1	1	1
M.A.				
Canada			1	1
Able to operate effectively in both languages		-	1	-

2.5.c CHART II Area Surveys

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s and M.A.'s employed in Area Surveys, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

Age Groups	No. of individuals in age group	B.A.		No. of individuals in age group	M.A.	
		Average no. of working years since graduation	Average no. of years employed in present organization		Average no. of working yrs. since graduation	Average no. of years employed in present organization
21-25						
26-30						
31-35						
36-40						
41-45	1	2.0	2.0	2	6.5	5.5
46-50						
51-55						
56-60						
61-65						

BRIEF

TO

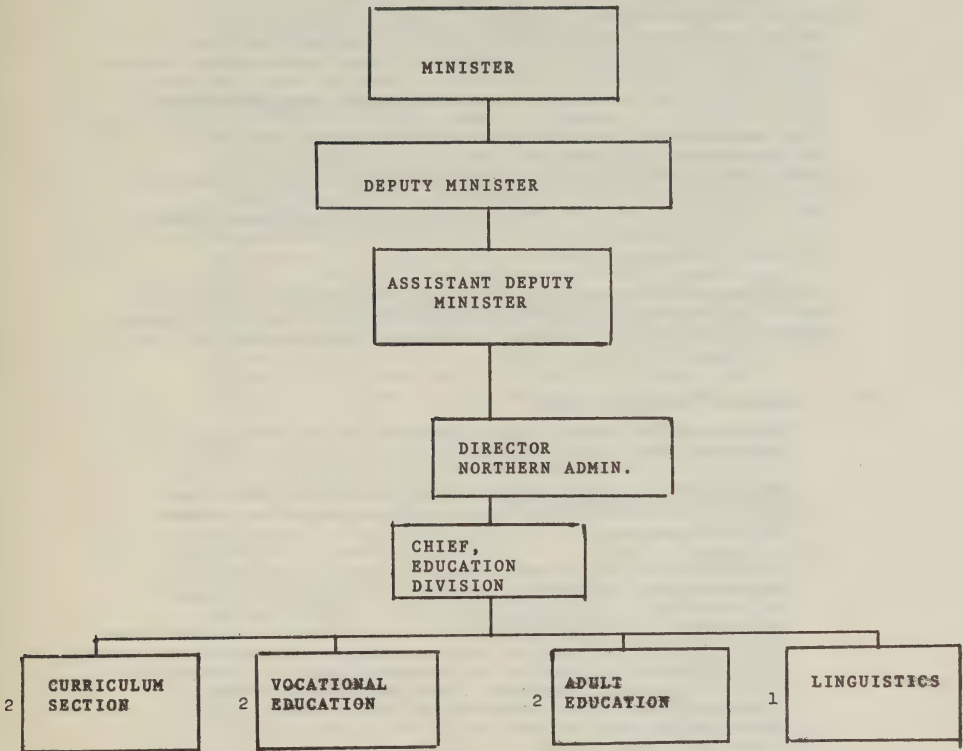
SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

Education Division, Northern Administration Branch

2.1.c Block Diagrams of Units Responsible for Scientific Activities (Support services and units solely concerned with extramural research are not included).

Education Division, Northern Administration Branch



Section heads employ a specialist staff to design programs and collect information basic to program design and implementation. Their responsibilities are dual in nature, and include research and applied skills.

1.-Incidental Research

2.- Only contract studies by outside agencies

2.2 Organizational Functions

- (a) The Education Division is responsible for education in northern Canada. There are no statutes which set out functions and powers regarding scientific activities.
- (b) The Education Division carries on very little original research but makes use of the results of research carried out by other agencies. It promotes research on topics related to northern education by supplying funds for such projects either in co-operation with another Division or Department or on its own. A number of these projects involve surveys and data collection. The results are studied and applied to the development of programs and to the supplying of educational services of various kinds in support of northern cross-cultural education (academic, vocational, adult). One exception is the Testing Program which was administered by our own personnel to discover norms of achievement for northern pupils.

The Education Division has a policy for granting 'education leave' to members of staff in order that they may take higher education or do educational research. This is with full or part salary.

(c) i) Other Federal Agencies

The Education Division can make use of the Northern Research Services of the Department.

The Education Division has indirect contact with the National Research Council through the Northern Science Research Group.

The Education Division co-operates with and exchanges information with Federal agencies on matters related to education in general and northern education in particular. The Northern Health Services of the Department of Health and Welfare co-operate with us by conducting Mental Health Clinics in the north, by providing nutrition guide - lines for people residences, and on other matters referred to it. The Dominion Bureau of Statistics makes statistical studies on matters related to northern education. The National Film Board co-operates with the Education Division on northern film and filmstrip production and the research related to these activities.

Within the Department the Engineering Division provides information from their own and other research on the types of schools and residence suitable for northern construction. The Indian Affairs Branch provides information on studies conducted and programs developed. Activities in the Northwest Territories of the Department of Manpower and Immigration are implemented almost exclusively by officers of this Department. Their facilities and machinery are often used in surveys and data collection by Vocational Education Section of the Education Division.

ii) Industry

In the Education Division the Vocational Education Section promotes and makes use of industrial research.

Major occupational and tourism studies have been completed. Mining and commercial fishing surveys are in progress. A job opportunity survey is planned and will be carried out in co-operation with industry. Industry is also co-operating with researchers to study the relocation of Eskimos into areas with a demand for labour. Studies planned for 1969-70 are: analyses of the transportation, communication, and service industries, etc.

iii) Educational Institutions

The Division maintains liaison with Universities, and Colleges of Technology and Education regarding new developments in adult and cross-cultural education.

iv) International Activities

The Education Division has been represented by its chief at the World Conference in Social Education sponsored by UNESCO, at the Commonwealth Education Conferences in New Delhi and Ottawa, and at the Alaska Conference of the American Association for the Advancement of Science. There is an exchange of scientific information with the Departments of Education of Denmark, Australia, and Alaska.

- (d) On occasion the Department surveys its own operational effectiveness by appointing a Commission to assess and report. In 1965 the Carrothers Commission to assess and to do this and to make recommendations as to the implementation of the part of the Glassco Report ~~which~~ referred to the North. The Glassco Report made recommendations in relation to northern education, on the following topics: (1) transfer of operation of schools to territorial administration, (2) curricula, and (3) adult education

The Carrothers Commission Report went a step further in each case but maintained the same type and tone of comment. It recommended that a Territorial Department of Education take over the transfer of operation of schools. Task Forces which met in 1967 and 1968 made recommendations as to the transfer of education positions to territorial administration (i.e. the number and time of transfer).

In the Education Division itself this process is carried out by program appraisals and statistical studies. Papers on various aspects of the education program are prepared for the Council of the Northwest Territories and debated in Committee or general Council sessions.

Outside consultants examine various aspects of the system and report on their findings, e.g. Katz' study of Pupil Residences in the Mackenzie District.

- (f) In 1955 the Department became responsible for Education (academic, vocational, adult) in northern Canada and the Education Division came into being. Since 1955 schools have been constructed in all settlements in the North where school population in sufficient numbers exists. School enrolment has increased from less than 20% to more than 90% of the school age population. The development of vocational education has paralleled the development of academic education. Program development in both fields has been making good progress. Adult Education was late in being started and it is only in the last two years that it has gained momentum. Thus overall the discharge of the responsibility for northern education has been marked by intense activity and progress toward establishment of an efficient educational system in Northern Canada.

- (g)
 - 1) Complex problems of cross-cultural education, including instruction in English rather than the vernacular (Eskimo, Indian) of a large segment of the school population.
 - 2) Socio-economic problems resulting in low motivation and alienation from school and education programs.
 - 3) Lack of a teaching staff trained for the specific type of service required.
 - 4) The Adult - youth (generation) gap accentuated by the problems of rapid acculturation.
- (h) Major changes in organization functions are being planned in relation to the transfer of functions to the Government of the Northwest Territories and the comprehensive re-organization of the Department.

2.3 Personnel Policies

There are no research positions as such in the Education Division.

2.4 Distribution of Activities

- (a) The Education Division's spending on developmental research has been entirely within the Northwest Territories and Arctic Quebec.
- (b) The entire North provides almost limitless opportunities for worthwhile educational and other research.
- (c) In the past five years there have been two testing programs to discover norms of achievement for northern pupils. This is done on a biennial, not an annual basis.

Each year a limited number of teachers, some of whom do research, are granted leave for higher education.
- (d) The work of the Education Division contributes directly to community development of the N.W.T. and Arctic Quebec. Adult educators are trained in community development.

2.5 Personnel Associated with Scientific Activities

The Education Division is associated with operational research and is not involved with scientific activities. Surveys and data collections are done by contract.

2.6

Cost of Research Activities as compared to Total Expenditures

	<u>Total Education Expenditures</u>	<u>Data Collection</u>	<u>Higher Education</u>	<u>Testing</u>	<u>Linguistic Research</u>	<u>Total Cost of Research</u>
1962-63	\$ 7,763,317	-	18,000	-	NIL	\$18,000
1963-64	7,238,272	-	20,000	-	NIL	20,000
1964-65	7,932,087	-	26,000	1,000	1,000	28,000
1965-66	10,225,586	1,640	32,500	6,000	1,000	41,140
1966-67	11,501,691	1,000	42,000	6,500	2,000	51,500
1967-68	12,280,498	40,000	65,000	5,000	3,000	113,000
1970-71	19,970,600	50,000		15,000	10,000	75,000
1971-72	19,710,000	50,000		15,000	10,000	75,000
1972-73	18,977,000	50,000		15,000	10,000	75,000
1973-74	18,400,000	50,000		15,000	10,000	75,000

2.7 Research Policies

Research that is required is contracted out.

2.8 Research Output

N/A

2.9 Projects

See Appendix A

2.10 Organizations not currently engaged in scientific activities

- 1) Greater use of computer services will be one change in technology which will affect the agency's operation. The increased use of electronic instructional devices will demand greater resources in this field. It is also possible that a system-wide research information service will be set up for receiving and clearing data.
- 2)
 - (a) Systematic handling of data.
 - (b) Information more readily and more quickly available
 - (c) Greater use of data and results of research
 - (d) More research activities
 - (e) Less time lag between development of new technology and implementation in the education process.
- 3) See Appendix A See Appendix A for a listing of studies. See Appendix B for a list of publications prepared for the Education Division for use in northern Schools.

inadequate housing. This will be researched later to see if changes occur and if they can be credited to the new rental housing program for Indians in the Mackenzie District.

(A above) Scientific Discipline (2) f sociology -
A above

(A above) Area of Application (13) - social
policy (behaviour patterns)

(a) Operational

1968/69	\$5,000	(A above)
1969/70	\$5,000	(A above)
1970/71	\$5,000	(A above)

Part II.2 7) Research Policies

There is no stated policy. The newly formed committee has prepared terms of reference which are pending approval - a) 1 - 7
b) 1 - 9

Part II.2 8) Research Output

Nil - 1 - 10

Part II.2 9) Projects

Nil 1 - 2

Appendix AI General

Below are four areas in which we have research activities and expenditures:

- (a) Data collection and surveys
- (b) Testing
- (c) Higher Education
- (d) Linguistic Research (Eskimo and Indian)

Data Collection and Surveys are usually carried out by contracting out to capable and experienced researchers or to Senior University Students during the summer months. The following are these activities as shown by our records.

1. Professor Joseph Katz - Report of 1965 dealing with "Educational Environments of School-Hostel complexes in the Northwest Territories".
2. Professor E. Stevenson - Report of 1967 on the "Problems of relocation of Eskimos and Indians of the Northwest Territories". Project was under the auspices of Northern Co-Ordination and Research Centre with the Education Division contributing toward the cost involved.
3. R. Jelking - in 1967 prepared a functional analysis of the Mining Industry in the Northwest Territories.
4. John Murray - in 1967 prepared a functional and occupational analysis of the Tourist Industry in the Northwest Territories.
5. Labour Force Survey - In 1967 in co-operation with the Dominion Bureau of Statistics a survey of the labour force in the Great Slave Lake area of the Northwest Territories.
6. Crispin Morris - In 1968 carried out a functional analysis of Government operations in northern Canada.
7. Gilbert Lance - In 1968 carried out a functional and occupational analysis of the fishing industry in the Northwest Territories.
8. Jon Nightingale - In 1968 carried out an occupational analysis of the mining industry in the Northwest Territories.
9. David Preston - In 1968 carried out a manpower survey of the Frobisher Region, N.W.T.
10. Labour Force Survey - In 1968 in co-operation with Resource and Economic Development Group a Labour force survey was carried out in the Keewatin Region, N.W.T.

Testing: Jackson Program

A testing program was first attempted by the late Don Jackson to establish norms for the achievement of pupils in the Northwest Territories. The analysis and reporting was undertaken by Dr. R.S. MacArthur, Professor of Educational Psychology, University of Alberta. Publication of results is dated 1965 on previous testing.

MacArthur Program reported the norms for pupils of the Mackenzie District. The report was printed in 1965, but testing was done previously.

Macdonald Program of 1965-66 - The testing program was carried out in late 1965 and the report printed in 1966. This program took in the Eastern Arctic as well as the Western Arctic.

Testing Program 1967-68 - This program was carried out by our own staff. The expenditure will therefore list only the cost of tests and mailing. Grades II, IV and VI were tested with Metropolitan Achievement Tests as had been done in the two previous programs. Results have been received but have not yet been compiled for publication.

Higher Education - Under the terms of reference of this paper all expenditures of educational leave come under this terminology.

Linguistic Research - The 'New Orthography' has been produced as a result of this research work.

II The sections of the Education Division which are involved with research activities are:

- (1) Vocational Education
- (2) Curriculum Section
- (3) Linguistics Section

Vocational Education interests lie in the data collection and surveys. These were mainly related to employment and manpower. The survey on 'hostels' and 'effects of housing' are exceptions.

III The 'Education Research' in which the Curriculum Section participates is listed below.

1. Consultative services to northern teachers preparing Masters Doctoral Theses and to other researchers, advising them on problems relating to the nature of their studies.
2. Direction of special research projects such as the development of northern norms for standardized tests, carried out by members of the Curriculum Section or by guest workers on contract.
3. Conducting Action-Research projects such as the development of a system-wide testing program, and the experimental try-out of new school programs and instructional materials.
4. Evaluation Studies in northern schools of new approaches to instruction such as team teaching, programmed learnings, and special reading programs and of new developments in instructional technology such as language laboratories, various kinds of audio-visual materials and other forms of teaching devices.
5. Liaison with Unesco, the Universities, Government Departments, Canadian Council for Research in Education, and other bodies interested in research in northern Canada.
6. Preparation of papers to be presented at meetings of National Professional Associations or for publication in Educational Journals.

7. Editing Monographs on research on Northern Education.

CURRICULUM MATERIALS

Education Division
Northern Administration Branch
Department of Indian Affairs & Northern Development
Ottawa, Canada

Send to _____ Date _____

Address _____

Title		Req'd
<u>Authorized Books</u>		
1. Authorized Textbooks & Instructional Materials	1966	
2. Library Books	1966	
<u>Language Arts</u>		
1. Curriculum Guide, Language Arts, Grades I-VI, (Mackenzie District)	1966	
2. Let's Begin English, A Program for Teaching English as a Second Language, Lesson 1-50	1965	
3. Let's Begin English, A Program for Teaching English as a Second Language, Lesson 51-85	1967	
4. Let's Begin English Picture Book (Being revised)	1965	
5. Games & Activities for Teaching English as a Second Language	1965	
6. Language Program, Beg's. to Gr. II (Inuvik)	1962	
7. Language Program, Grades III to VI (Inuvik)	1962	
8. Beginning with the Beginners	1962	
9. An Experiment in Div. 2 Reading (Inuvik)	1962	
10. Junior High School, Remedial Reading Program	1962	
11. Remedial Survey Guide for the Mechanics of Reading	1958	
12. Verbs in Pictures	1966	

Title			Req'd.
<u>Northern Readers for Primary Grades</u>			
1. Seal Hunt	(English)	1966	
2. The Story of Papik an Eskimo Boy	(English & Eskimo)	1963	
3. Niocyte and Her Family	(English & Eskimo)	1963	
4. Nuna	(English)	1963	
5. A Weekend in Ottawa	(English)	1963	
6. Mr. Larson's Visit	(English)	1963	
7. My First Book	(English)	1963	
8. Here's Jack	(English)	1962	
9. Igloolik	(English & Eskimo)	1962	
10. Eskimo Way of Living	(English)	1959	
11. The Seal Book, An Experimental Pre-Primer		1967	
12. Teaching Notes for the Seal Book		1967	
13. Flash Cards for the Seal Book		1967	
<u>Testing & Evaluation</u>			
1. Test Item Construction		1962	
2. Assessing the Intellectual Ability of Indian & Metis Pupils at Fort Simpson, Northwest Territories		1962	
3. Mackenzie District Norming Project		1965	
4. N.W.T. Testing Program, Mackenzie District Norms		1965	
5. Tentative Norms for Metropolitan Achievement Tests		1966	
6. Northwest Territories Testing Program		1967	

Title	Req'd
<u>Social Studies</u>	
<u>Curriculum Guides and Reports of Curriculum Committees</u>	
1. Report of Social Studies Workshop, Inuvik 1961	
2. Primary Social Studies, Inuvik 1962	
3. Social Studies Course Outlines, Grades IV-VI, Inuvik 1962	
4. Social Studies, Grades I-VI, Aklavik 1962	
5. Social Studies Program, Grades I-III, Hay River 1962	
6. Report of Yellowknife Committee on Social Studies 1962	
7. Report of Fort Smith Social Studies Curriculum Committee 1962	
8. Report of Fort Simpson Social Studies Curriculum Committee 1962	
9. Proceedings of Mackenzie Education District Social Studies Studies Workshop, Yellowknife 1962	
10. Curricular Guide, Social Studies Program, Mackenzie Education District, Experimental Edition 1962	
11. Proceedings of Mackenzie Education District Social Studies Evaluation Committee 1963	
12. Mackenzie Education District Social Studies Program Special Issue of Curriculum Bulletin, Sept./62, Vol. 2 #2	
13. Social Studies Program, Grades I-III, Baker Lake 1963	
14. Social Studies Program, Grades I-III, Rankin Inlet 1963	
15. Social Studies Program, Grades I-III, Chesterfield Inlet 1963	
16. Social Studies Program, Grades I-VI, Great Whale River 1963	
17. Social Studies Program, Grades I-VI, Fort Chimo 1963	
18. Social Studies Program, Arctic Education District, Interim Edition 1958	
19. Curriculum Guide, Social Studies, Arctic Education District, Experimental Edition 1964; 1967	
<u>Audio-Visual Services</u>	
1. Audio-Visual Services Handbook 1966	

Title		Req'd.
<u>Special Programs & Reports</u>		
1. Providing for Individual Differences	1961	
2. Accelerated Academic Upgrading Program	1962	
3. Programmed Learning with Teacher Participation, (A research report)	1965	
4. Curriculum Guide, Social Studies, Churchill Vocational Centre	1965	
5. Curriculum Guide, Science, Churchill Vocational Centre	1965	
6. Curriculum Guide, Mathematics, Churchill Vocational Centre	1965	
7. Curriculum Guide, Language, Churchill Vocational Centre	1966	
8. Girls Vocational Curriculum Guide, Ungraded, Churchill Vocational Centre	1966	
9. Boys Vocational Curriculum Guide, Ungraded, Churchill Vocational Centre	1966	
10. Dressmaking & Tailoring 12, 22, 32, Grades 10, 11, 12, Sir John Franklin School	1966	
11. Driver Training, Age 16 and over	1967	
12. Northern Survival, Ungraded	1967	
13. Vocational Education Handbook (Being revised)	1965	
<u>Home Economics</u>		
1. Northern Cookbook, Grades 7 to 12	1967	
2. Foods for health, Ungraded (Eskimo & English)	1966	
3. Foods for Health, Ungraded (English)	1964	
4. Practical Programs in Homemaking & Related Activities, Ungraded	1964	
<u>Industrial Arts</u>		
1. Plastics, Ungraded	1967	
2. Small Oversnow Vehicles, Ungraded	1965	
3. Practical Programs in Industrial Arts & Related Activities, Ungraded	1964	
4. Junior High School Industrial Arts, Grades 7, 8, 9, Curriculum Guide	1963	

Title	Req'd.
<u>Mathematics</u>	
1. Northern Workbook in Mathematics, Caribou Series 1966	
2. Sets and Numbers, A Pre-Number Program 1966	
3. Charts of Sets 1 to 10 1964	
4. Modern Mathematics 1964	
<u>Health & Physical Education</u>	
1. Health and Physical Education 1962	
2. Physical Education Program for Arctic Schools 1964	
3. Eskimo Games, A supplement to Arctic Physical Education Program 1965; 1967	
4. Northern Physical Education Illustrated, A supplement to Arctic Physical Education Program 1965; 1967	
<u>Science</u>	
1. Colour Slides of Northern Flora and Fauna 1965	
2. Resource Unit on Northern Flora and Fauna (In preparation)	
3. Northern Science Charts with Explanations 1965	
4. Science Programs of the Provinces of Canada, Elementary Grades 1965	
5. Conserve Our Resources 1957	
<u>Art</u>	
1. Initiating an Art Program 1962	
2. What Can We Use? 1962	
3. Where Can We Get It? 1962	
4. What Shall We Do? 1963	

Appendix C

Senate of Canada
 Special Committee on Science Policy
Adult Education

In reviewing the terms of reference of the Special Committee on Science Policy of the Senate of Canada, I felt that the Adult Education Section has little to its credit in the field of research. The Adult Education Section is in the initial stages of development. Since the appointment of field staff late in 1967, the program has been exploratory but not on a research basis.

The Department's Northern Co-ordination and Research Centre has been considered as the arm responsible for research. Each year the Education Division is asked for topics in the educational field requiring research. None in the Adult Education area has been accepted in the eight years since I have been here. The reason probably is due to the fact that there has been no time between receiving the request, and the date required to properly document the topics for research. In the past there have been ad hoc committees on research within the Division, and some studies have resulted. The recently named Education Division committee on research is a step towards promoting educational research and data collection which will provide a basis for program development and for greater understanding of human behaviour.

The sections of the terms of reference which were marked for Adult Education to answer were as follows:

Part II 2. 1) Organization (d)

No formal agreements with agencies outside of Canada.

Part II 2. 4) Distribution of Activities

The Adult Education budget does not include money for research, either intramural or extramural. It is presumed that the parts of the question relate to expending funds. (A data collection study is currently underway; five thousand dollars will be expended and to be valuable a similar amount should be spent in 1969/70 and 1970/71.)

2. 4) (c) refers to the scientific activities, therefore the answer is none.
2. 4) (d) refers to the role of agency (Education Division, Adult Education) in contributing to regional development as related to the scientific activities - Not as a participating agency in scientific activities.

2. 5) Personnel Associated with Scientific Activities

None. This covers a - h since it refers to staff doing scientific research.

2. 6) Expenditures Associated with Scientific Activities

- (a) Total funds 1968/69 \$5,000

Function (2)

A Five Thousand dollars (\$5,000) are being spent on collecting data on family behaviour patterns which may be related to

inadequate housing. This will be researched later to see if changes occur and if they can be credited to the new rental housing program for Indians in the Mackenzie District.

(A above) Scientific Discipline (2) f sociology -
A above

(A above) Area of Application (13) - social
policy (behaviour patterns)

(a) Operational

1968/69	\$5,000	(A above)
1969/70	\$5,000	(A above)
1970/71	\$5,000	(A above)

Part II.2 7) Research Policies

There is no stated policy. The newly formed committee has prepared terms of reference which are pending approval - a) 1 - 7
b) 1 - 9

Part II.2 8) Research Output

Nil - 1 - 10

Part II.2 9) Projects

Nil 1 - 2

2.5.c CHART I Education Division

B.A.'s and M.A.'s employed in Education Division, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Country of birth	B.A.		M.A.	
	England	N. Ireland	Canada	
Country of Training				
Secondary Schooling				
Wales	1			
N. Ireland		1		
Canada			1	
B.A.				
Wales	1			
England		1		
Canada			1	
M.A.				
Canada			1	
Able to operate effectively in both languages	1	-	-	

2.5.c CHART II Education Division

Number of working years since graduation and number of years employed in present organization of B.A.'s and M.A. employed in Education Division, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

Age Group	No. of individuals in age groups	B.A. Average no. of working years since graduation	Average no. of yrs. employed in present organization	M.A.		
				No. of individuals in age groups	Average no. of working years since graduation	Average no. of years employed in present organization
21-25						
26-30						
31-35	1	9.0	5.0			
36-40	1	14.0	9.0	1	2.0	2.0
41-45						
46-50						
51-55						
56-60						
61-65						

BRIEF

TO

SENATE COMMITTEE ON SCIENCE POLICY

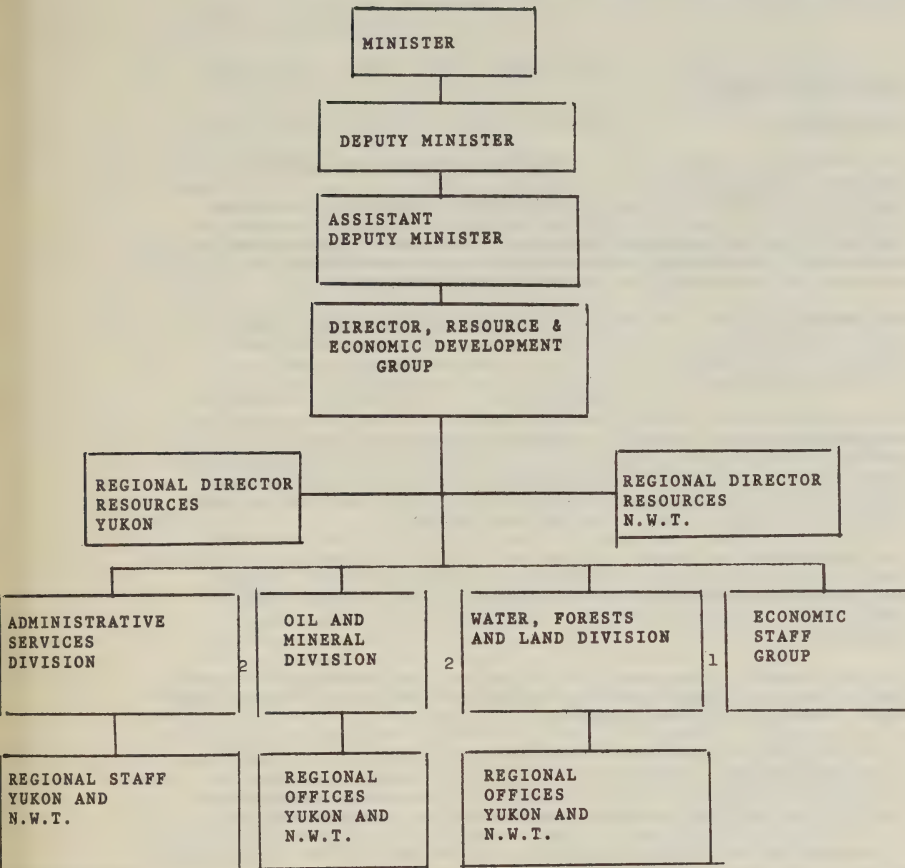
Department of Indian Affairs and Northern Development

Resource & Economic Development Group

December 1968

2,1.c

Resource and Economic Development Group



The Resource and Economic Development Group is responsible for management of northern renewable resources and for fostering the economic development of the north.

1. - Substantial Scientific Research
2. - Only contract studies by outside agencies

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern
Development, Resource & Economic Development
Group, (Since Oct. 19, 1968 The Development Branch)

DEVELOPMENT BRANCH

Introduction

The Development Branch is responsible for the management of all northern renewable and non-renewable resources and for furthering the economic development of northern Canada. Its tasks are to seek out and identify all means whereby the economy of the north can be expanded at a more rapid pace, to develop a broad plan of economic progress and to recommend specific projects and policies for achieving the objective.

The Branch consists of two resource management divisions -- an Oil and Mineral Division, and a Water, Forests and Land Division; an Economic Staff Group; and an Administrative Services Division.

The Economic Staff Group provides advice to senior departmental management on the northern economy; it provides advice to the resource management divisions; it undertakes studies on matters relating to the economic development of the North; it renders assistance to other Branches of the Department in matters relating to economics and economic development.

The undertaking of major studies in various fields is a continuing function of the Economic Staff Group. Some of these studies are conducted entirely within the Group, while others, due to limitations in staff strength, are undertaken by outside consultants.

The two resource management divisions of the Development Branch also commission studies with consultants, but rarely undertake major research projects themselves.

An extreme view would be to say that no research is undertaken in the Development Branch and that all the activities may be classified under one of the following: resource management, feasibility studies, project implementation, advisory work.

In attempting to define the boundaries of "scientific research" in the Development Branch, the limits have been set at the functions undertaken by the Economic Staff Group as well as all external consultant work. This limit is arbitrary in many respects.

The Development Branch, (formerly the Resource and Economic Development Group) has been effectively in operation since April 1966, having been formed at the time of the major Departmental re-organizations. Staffing of the Economic Staff Group commenced in April 1967 and the Group was effectively in operation by November 1967.

The Economic Staff Group is functionally divided into three sections. A Resources Section is concerned with northern resource development. A Transportation Section undertakes studies in the transportation field, and an Economic Projects Section undertakes projects which do not fall directly under the other two specializations. A Statistical Section acts in a support capacity to the Economic Staff Group as a whole, compiles and processes statistical data on all phases of northern economic activity but is under the control of the Statistics service.

The following major studies were undertaken by outside consultants in the last two years, (the cost of the study is presented as an indicator of scale):

1. Hydro - Electric Resources Survey of the Central Yukon Territory (\$84,500).
2. Feasibility Study, Lead - Zinc Smelter, Pine Point N.W.T. (\$160,000).
3. Yukon Transportation Study (\$68,800).
4. Yukon Economic Study (\$153,250).
5. Water Resources Study (in Progress), (\$115,000).

The following major studies have been undertaken by the Economic Staff Group. (The time input to date of Economic Staff Group personnel, in man-months is supplied as an indicator of size):

1. Manpower Study of the Northwest Territories (in progress, 19 man-months to date).
2. "Cost-Benefit Analysis of a Lead-Zinc Smelter in the Northwest Territories" (12 man-months).
3. "Power Policy for the North" (in progress, 6 man-months).
4. "Implications of the Carter Taxation Proposals for the Mining Industry in the North" (3 man-months).
5. "The Need for Canadian Access Through the Alaska Panhandle" (4 man-months).
6. "Transportation for the Coppermine Area" (3 man-months).
7. Employment of Northern Natives by the Mining Industry in the North. (in progress 2 man-months.)

From April 1967 to September 1968 the Economic Staff Group has put in about 120 man-months of professional time. The above mentioned projects account for 40 per cent of the time input. Minor research projects (defined as those taking less than two man-months each) accounted for probably another 30 per cent of the effort, with the remaining 30 per cent of the effort being spent at meetings, conferences, consultations, monitoring consultants and miscellaneous memos and tasks which cannot be defined as individual studies or research projects.

Specific Comments in Response to Sections of the Guide

(numbering as in the guide)

2.2 Organizational Functions

2.2 (c) (i)

The Organization's functions and responsibilities in relation to other Federal agencies:

In its resource and economic development role, the Branch has extensive contact with the Departments of Energy, Mines and Resources, Transport, and Public Works. Contact is also strong with the Department of Industry. These contacts are primarily via the conference room and joint participation in various task-forces and study groups. In the field the

administration and furthering of mineral development is a responsibility which the Branch carries out in the broader framework of Federal and Territorial regulations.

2.2 (c)(ii)

Industry looks to the Branch for assistance in all matters pertaining to resource development in the areas where the Branch performs its "pseudo-provincial" role, for example, claim recording, lease granting, exploration incentive program, roads assistance program, mine inspection, property examination, map and report distribution, to cite the more salient ones in the field of mineral development. Similar activities may be cited in the fields of forestry, lands and water.

2.2 (c)(iii)

Educational Institutions:

Contact is informal and is primarily in the field of information exchange at conferences. Other links are in the course of personnel recruitment and in research contract allocation.

2.2.(c)(iv)

International representation and monitoring of scientific activities outside of Canada.

No formal role in the field is carried out. Informal ad hoc contact is made at conferences, in conducting of investor orientated meetings (to date only in the United States), by lending resource development films, by following developments in the journals and bulletins.

2.2.(d)

Development Branch, Division Chiefs Meetings; Economic Staff Group meetings.

2.3 Personnel Policies

2.3 (a)

No direct contact is made with the graduating classes and all recruiting needs at that level are channeled through the Public Service Commission.

2.3(b)

No unique criteria are in operation for the purpose of identifying creative and effective researchers. Effort is directed to strengthening the effectiveness of the Departmental personnel review procedures.

2.3(c)

A familiarity in depth with the performance and career goals of individuals is aimed at, thereby permitting early spotting of promising talent. The research role of the Branch is a limited one and a highly applied one. Accordingly, this point as well as points (d) and (e) do not effectively apply, since, with the small "research orientated" personnel there is little scope for independent action in this field. Accordingly, as mentioned previously, effort is directed to strengthening the overall Departmental machinery for spotting promising talent and thereby offering adequate career potential.

2.4 Distribution of activities

- 2.4(a)
The regional pattern of funds expended for research activities would roughly be an equal division between the Yukon and the Northwest Territories.
- 2.4(b)
The regions of the Territories which will receive the greatest attention in terms of research expenditures will be those offering greatest long-term promise for economic development.
- 2.4(c)
All the research activities which have been itemized by cost and subject matter, together with all overhead expenditures (thereby making up the total budget of the Economic Staff Group) may be considered to have been directed to the "investigation of regional problems or phenomena".
- 2.4(d)
The recent renaming, to "Development Branch" is indicative of the fact that essentially all the effort of the Branch is directed to regional development.
- 2.4(e)
The wording of this point is not clear. The Branch is increasingly moving into sophisticated analytical techniques of measuring the costs and benefits of specific programs. In fact, the general objective of most of the applied research projects which are undertaken is to measure the costs and benefits of a specific line of action. The actual choice of distribution of scientific activities is not currently performed on any cost and benefit criteria, but is directed in accordance with development policy.

2.5 Personnel associated with scientific activities.

- 2.5(a)
The Economic Staff Group was defined as the principal research orientated unit in the Branch. The Personnel breakdown is as follows:

Professional economists: 9
Statistical support (but also under Mr. Maarten): 3
Clerical: 2

- 2.5(b)
The activities of the Chief of the Group may be defined to lie principally in Group direction, planning and administration.

	1968	1969	1970	1971	1972	1973
Bachelor	6	7	9	9	9	9
Master	1	2	5	5	5	5
Doctorate	<u>2</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>
	9	12	17	17	17	17

- 2.5(g)
No staff is currently on educational leave.
- 2.5(h)
Number of university students given summer employment:
1967-2, 1968-1

2.7 Research Policy

As indicated in the preamble, the effective intramural research time of the Economic Staff Group has, to date, been about four man-years. The completeness, (or lack thereof) of the response to the questions, has to be viewed in the light of this limited internal research effort, as well as in the light of the few major studies which were undertaken externally under contract. Project initiation is in response to a "need". The need may be defined internally by Branch management or externally by senior Departmental management. The small scale of operations during only one year of effective functioning, may be defined as a "shaking down" phase. Sophisticated techniques of setting priorities and maintaining them current, are only now being evolved in the light of an expanded role of the Branch.

2.9 Projects

The preamble lists the significant studies undertaken. A "best work" example of internal work would be the "Cost-Benefit Analysis of a Lead-Zinc Smelter in the Northwest Territories", and can be defined as applied research.

2.5.c CHART I Economic Development

B.A.'s, M.A.'s, and Ph.D.'s employed in Resource and Economic Development Group, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Country of Birth	B.A.		M.A.			Ph.D.		
	Canada	Poland	Australia	U.S.A.	West Indies	Canada	Poland	England
Country of Training								
Secondary Schooling								
Canada	2					1		
Poland		1						
Australia			1					
U.S.A.				1				
West Indies					1			
South Africa							1	
England								1
B.A.								
Canada	2			1	1	1		
Poland		1						
Australia			1				1	
South Africa								1
England								
M.A.								
Canada			1	1	1	1	1	
England								1
Ph.D.								
U.S.A.							1	
Canada								1
Able to operate effectively in both languages	-	1	-	-	-	-	-	1

BRIEF

TO

SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

Financial and Management Adviser

December 1968

BRIEF TO THE SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern
Development, Financial and Management Adviser

The two divisions concerned with research in this group are Computer Services and Central Statistics - no research is conducted by these units but they provide computer and data branch services. The Central Statistics division was only formed in September 1968. Divided information on their activities is included in their brief.

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern
Development, Computer Information Systems

TERMS OF REFERENCE

The objectives planned for Computer Information Systems are broad in scope and place emphasis on a unified approach to a field concerned with many diversified activities. The unit is expected to initiate, promote and develop modern and advanced techniques of information processing with the Department of Indian Affairs and Northern Development. In conjunction with the various components of the Office of the Financial and Management Adviser, the division will participate in the implementation of the management improvement programme by using the techniques associated with management science and information processing.

Computer Information Systems will provide systems and programming services in both the business and scientific fields in order to improve present methods and to enable officers of the Department to concentrate on their own disciplines. It will further be expected to co-ordinate all automatic data processing activity within the Department in order to maintain a high standard of work; to ensure a comprehensive approach to interrelated activities; and most importantly, to create a professional environment in the area of information processing.

The detailed activities of this division are as follows:

- identifying, promoting, designing and implementing information systems.
- utilizing sophisticated data processing equipment to implement the various activities.
- advising Branch Directors of the administrative aspects of programmes to ensure unified and stream-lined procedural policies.
- applying new developments in the systems field, developing new techniques, and assessing the Department's long and short term requirements.
- developing conceptual systems involving advanced mathematical procedures such as model building, simulation studies, recursion formulae, linear programming and regression analyses.
- scientific systems analysis and programming.
- negotiating and co-ordinating all operational requirements of information processing between the Department and suppliers or consultants.
- providing detailed machine coding using such computer languages as COBOL and FORTRAN.
- investigating and making recommendations on new programming techniques and machine developments.
- developing generalized utility routines specific to the Department.

Attached are statistical data on staff projects and expenditures.

2.5 Personnel Associated with Scientific Activities

a) Personnel Establishment - 15

b) One

d)	Bachelors	Masters	Ph.D.
1966	1	1	
1967	6	1	
1968	6	1	
1969	6	2	
1970	8	2	1
1971	12	3	1
1972	12	3	2
1973	15	4	3

e) Not Applicable

f) i) 80%

ii) 0

iii) 0

iv) 50%

g) Nil

h) Two

2.6 a)

FUNCTIONS:	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74
1) Intramural R & D	50.4	54.8	80.8	85.2	91.2	99.2	104.0	110.0
2) Data Collection	25.2	27.4	40.4	42.6	45.6	49.6	52.0	55.0
3) Scientific Information	50.4	54.8	80.8	85.2	91.2	99.2	104.0	110.0
	126.0	137.0	202.0	213.0	228.0	248.0	260.0	275.0

SCIENTIFIC DISCIPLINE	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74
1) Engineering & Technology	16.0	17.0	25.0	26.0	28.0	31.0	32.0	34.0
2a) Agricultur- al Sciences	5.0	6.0	9.0	10.0	11.0	12.0	12.0	13.0
2d) Biological Sciences	21.0	23.0	34.0	36.0	38.0	41.0	44.0	46.0
2f) Mathematics	16.0	17.0	25.0	26.0	28.0	31.0	32.0	34.0
2j) Solid Earth Sciences	10.0	11.0	16.0	17.0	19.0	20.0	20.0	22.0
3b) Demography	21.0	23.0	34.0	36.0	38.0	41.0	44.0	46.0
3c) Economics	21.0	23.0	34.0	36.0	38.0	41.0	44.0	46.0
3f) Sociology	16.0	17.0	25.0	26.0	28.0	31.0	32.0	34.0
	126.0	137.0	202.0	213.0	228.0	248.0	260.0	275.0

AREAS OF APPLICATION	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74
11) Economic & Fiscal Policy	18.9	20.5	30.3	32.0	34.2	37.2	39.0	41.3
12) Regional Development	25.2	27.4	40.4	42.6	45.6	49.6	52.0	55.0
13) Social Wel- fare & Soc- ial Policy	31.5	34.2	50.5	53.2	57.0	62.0	65.0	68.7
14) Educational Techniques & Policies	25.2	27.4	40.4	42.6	45.6	49.6	52.0	55.0
15) Administrat- ion	6.3	6.8	10.1	10.6	11.4	12.4	13.0	13.7
16) Other (Con- servation)	18.9	20.6	30.3	32.0	34.2	37.2	39.0	41.3
	126.0	137.0	202.0	213.0	228.0	248.0	260.0	275.0

2.6 b) Refer to a) - Nil capital funds

CENTRAL STATISTICS

A Statistical Program
for the Department of Indian Affairs and Northern Development

Purpose and Scope of the Program

The purpose of the program is to develop, design and implement a statistical program which will provide the basis for planning, and for relating achievements to plans, for the entire Department.

Objectives of the Program

The objectives of the program are to create a comprehensive statistical data inventory which will:

1. Accommodate the development of policies and plans.
2. Facilitate the consideration of alternatives during planning and execution.
3. Measure program effectiveness.
4. Measure operational efficiency.
5. Meet the data requirements of internal and external agencies and provide other supplementary data as required.

The existing systems, i.e., personnel, financial management, manpower budgeting, equipment cost and utilization, together with the statistical data inventory, will provide a fully integrated management information system.

The program emphasis will be on orientation towards specific objectives, as stated by Branches rather than on needs for statistical data as anticipated by the Statistical Division.

Data Classification

For the purposes of classification, the data required by Departmental management may be categorized into four major groups:

1. Human
2. Natural
3. Physical
4. Financial

All of the data to be collected on behalf of the Department can be channelled into one of the major data categories, which in turn may be further divided into sub-categories, for example as follows:

1. Human
 - vital statistics, education, employment ability, occupations, recreation, status
2. Natural
 - agriculture, forestry, fisheries, minerals, game,

wild crops

3. Physical

- schools, hospitals, businesses, industries, farms, machinery, roads, utilities

4. Financial (non-government only)

- capital revenue, operating revenue, commercial activities, grants and subsidies, interest

Total System Concept

To provide management with balanced data, information from more than one category must usually be consolidated to give the complete picture of a particular situation. For example, the proposed development of a new industry might require information on population, labour availability, educational standards, roads and access. In addition, it might be necessary to relate the potential of the industry to the national economic picture, the current and future market demands and the local economic scene. To achieve a total system approach, information will therefore be drawn from all four major data categories, which derive their data from various sources such as our own Department, provincial government agencies, other federal government departments and private agencies. It is expected that much of this information will be computerized to speed the flow and to reduce the clerical work load. Wherever possible, such data will be fed directly into a central information source and then processed for transmission to the various levels of the Department from the operating field units to the Deputy Minister level, providing each level with information tailored to its needs.

Data Storage and Retrieval

The many sources of information will be catalogued and maintained in a master statistical data source index in the Central Statistics Division. Data itself will be stored in a central location by a method determined to be most suitable for the particular type of information, whether it be in conventional files, on computer tape or on microfilm. The data will be retired and disposed of when no longer needed according to the requirements of the originating branches.

Data Presentation

The collected data, once compiled and (when necessary) analysed, will be distributed to the Department in three major forms:

1. Regular reports, monthly, quarterly and annually.
2. Ad hoc reports.
3. On request for any statistical information stored in the data bank.

Impact of the Program

The major impact of the program will be to make available to operating units an appropriate combination of professional statistical knowledge which can be focused on any Departmental activity. These resources can be concentrated according to demand and priority to provide information which is accurate, meaningful, comprehensive and timely.

Overall Approach to New System

At present the data requirements of the Department are:

1. Being met by research-oriented groups and the data may or may not need refinement of approach.
2. Being partially met by established methods capable of integration with new and better methods.
3. Not being met because of vagueness of objectives, absence of standards, staff shortages, lack of system design, etc.

To establish the new system, it is intended to develop a framework which can be used as an infrastructure for the total statistical data system. At the present time the availability of data may be indicated by listing the four major categories in descending order: human, financial, physical, natural. Because of the ready availability of much of the required human resource data, it is proposed to begin implementation of the program by developing basic human resource information in the areas of education and vital statistics. Other data will then be integrated with the system, according to priorities to be established, until full coverage is obtained. The limited availability of specialist staff is a major factor in taking a selective approach at present.

Detailed Approach

To determine the human resource data requirements, the Central Statistics Division will conduct a series of meetings with the Education Divisions of the Department and all divisions having a direct interest in data relating to vital statistics.

The objectives of these meetings are:

1. To review statistical requirements in relation to set objectives.
2. To determine the existing information flow and to determine what, of the present flow, is needed and what can be disposed of.
3. To determine any new data required.

System development will then begin, in co-operation with the headquarters and field units concerned, to:

1. Combine the old and new information flows.
2. Develop an information flow system.
3. Set data priorities.
4. Develop collection, compilation and analysis procedures.
5. Determine manpower and material requirements.
6. Conduct thorough field testing.
7. Implement the system.

Determination of Priorities - The "Users" Committee

While the total statistical system is being developed, involving all four major categories, Departmental policies are likely to demand emphasis on specific resource areas. The setting of such priorities and of the overall Departmental Statistical Policy Objectives must be the responsibility of a Departmental Users Committee, with referral to the Executive Committee where necessary.

Statistical Organization

To develop this Statistical Program, the Department has established a Central Statistics Division in the Office of the Financial and Management Adviser. The Division is headed by a Chief Statistician, Mr. P.C. Marten, and contains three sections with the following major responsibilities:

<u>Section</u>	<u>Major Responsibilities</u>
Analytical Services	Development analysis of the socio-economic aspects of: <ul style="list-style-type: none"> Education Community Development Welfare and Social Matters Cultural Affairs Resource Development Industrial Development Land Management Tourism and Recreation
Statistical Services	<ol style="list-style-type: none"> 1. General statistical design. 2. Integration and preparation of data for analysis. 3. Provision of technical support to analysts. Provision of statistical research advice. Operations evaluation.
Operations	<ol style="list-style-type: none"> 1. Operational design and testing of data systems. 2. Data flow control: <ol style="list-style-type: none"> a) Receiving b) Indexing and storage c) Retrieval d) Disposal 3. Publication and release of statistical data and reports. 4. Liaison and co-ordination with field operational units. 5. Field training of operational staff. 6. Statistical forms control and design. 7. Provision of administrative services.

Implementation

Implementation of the new program will begin early in September with initial concentration on education and vital statistics. The opening of the September 1969 school year was set as the target date for the introduction of the combined vital statistics and education data system as part of the human resource category.

Other resource data, that is those involving natural, physical and financial resources, will be fed into the system as the program is developed, starting with the classification of all

data now available in the Department and adding additional information as required, depending upon priorities to be determined in conjunction with the Branches and the availability of specialist staff.

Some time will elapse before all Branch requirements are known and being served. Until that time, existing services must be maintained. Only with the utmost co-operation of all concerned can a system be built to serve today's needs and to phase out the requirements of yesterday without disrupting present services.

CENTRAL STATISTICS DIVISION

2.5 a) Personnel establishment -- Scientific - 2

b) one

d) Masters - one

Ph.D. - one

Estimates for:

	Bachelors	Masters	Ph.D.
1969	6	2	1
1970	9	2	1
1971	10	2	2
1972	11	3	2
1973	12	3	2

e) Not applicable

f) i) 0

ii) 50%

iii) 0

iv) 50%

g) none

h) none

	68/69	69/70	70/71 (\$ 000's)	71/72	72/73	73/74
Data Collection	250	300	360	400	440	480
Scientific Information	10	12	14	15	15	15
Biological	40	40	45	45	50	50
Demography	30	30	35	35	40	40
Economics	120	155	175	200	215	240
Sociological	70	85	110	135	150	165
Regional Development	70	97	109	125	125	140
Social Welfare & policy	60	75	100	125	140	165
Education techniques & policy	40	40	50	50	60	60
Administration	50	60	70	70	80	80
Wildlife	40	40	45	45	50	50
						<u>1,405,000</u>
b) not known at this time						
c) none						

2.5.c CHART I Financial and Management Adviser

B.A.'s, M.A.'s, and Ph.D.'s employed in Financial and Management Adviser's Office, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Country of Birth	B.A.		M.A.		Ph.D.
	Canada	Scotland	Netherlands	England	India
Country of Training					
Secondary Schooling					
Canada	2				
Scotland		1			
Netherlands			1		
England				1	
India					1
B.A.					
Canada	2		1		
Britain		1			
England				1	
India					1
M.A.					
Canada			1		
England				1	
Ph.D.					
U.S.A.					1
Able to oper- ate effectively in both lang- uages.	1	-	1	-	-

2.5.c CHART II Financial and Management Adviser

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s, M.A.'s, and Ph.D.'s employed in Financial and Management Adviser's Office, Department of Indian Affairs and Northern Development, by age group.

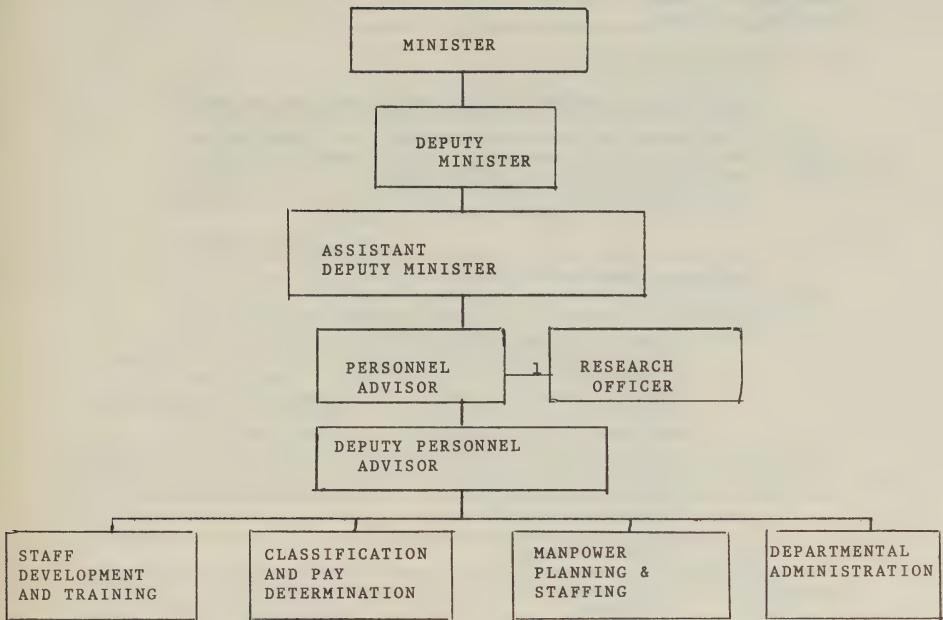
Data include research staff only.

Age Groups	No. of individuals in age group	B.A.		M.A.			Ph.D.		
		Average no. of working years since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working yrs. since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization
21-25	1	3.0	2.0						
26-30									
31-35	1	11.0	2.0	1	10.0	2.0			
36-40	1	10.0	2.0	1	6.0	.5			
41-45									
46-50									
51-55							1	16.0	1.0
56-60									
61-65									

BRIEF
TO
SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
Personnel Adviser
December 1968

2.1.c

Personnel



Personnel is responsible for manpower development and the formulation of policy designed to develop most effectively human resources within the department.

1. -Substantial Scientific Research

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
 Department of Indian Affairs and Northern
 Development, Input from the Office of the
 Personnel Adviser

2.3 Personnel Policies

- a) Specific requirements are put forward as necessary by the Branches, co-ordinated as a Departmental expression by Manpower Staffing, and sent to the Public Service Commission. The Commission sends recruiting teams to universities to fill the need. Departmental specialist representation for definite areas of recruitment can be arranged.
- b) No other than the personnel evaluation and skills inventory discussed below.
- c) Employee Evaluation Program and Skills Inventory
 - i) Employee Evaluation Program
 This has been in effect for two years. All areas of potential are disclosed in the individual reports which are appraised at senior levels. Employees in the research or research support category are reported on and appraised by seniors in the same category with the result that individual potential is judged on the basis of organizational goal achievement and personal extension.
 - ii) Skills Inventory
 This inventory questionnaire will be functional in January 1969. It is broken down to six categories, one of which is Professional and Scientific Skills and another Technical Support Skills. Professional, Scientific and Technological skills, amongst others, will be stored in a Data Processing System and will be retrievable on a selective basis.
- d). None, other than existing inter Departmental policies.
- e) Centres of responsibility estimate annual education and training expenses based on the organizational objectives and the individual needs expressed in the Employee Evaluation Program.

2.5 Personnel Associated with Scientific Activities

- a) One - Social Scientist
- b) -
- c) i) Canada
 - ii) Canada
 - iii) Canada - Bachelor
 - iv) Two, one in present organization
 - v) 28
 - vi) -

d)

DEGREE CATEGORY	YEAR											
	63	64	65	66	67	68	69	70	71	72	73	74
BACHELOR						1	1	1	1	1	1	1
MASTER								1	1	1	1	1
DOCTORATE												

e) None

- f) i) 0%
- ii) 0%
- iii) 100%
- iv) 0%

g) None

2.6 Expenditures Associated with Scientific Activities

FUNCTION	DISCIPLINE	APPLICATION	COST PER MAN YEAR
Intramural R & D	Sociology	Personnel Management	\$8,000.00

2.7 Research Policies

Activity within the office is developmental to date. The Policy is best described in the description of the research function attached to the form "Information for the Brief to the Senate Committee on Science Policy" which is forwarded with this paper.

The Research Function in Personnel Administration

A newly established research function, in addition to providing general support for the administrative activities of the Personnel Adviser, has begun, as an initial project, a study of the use of casual (uncertified) sick leave by employees of the Department. The results of this study are expected to highlight areas of concern which will then be examined in greater detail.

Running concurrently with this activity will be a detailed program of analysis of the various occupational groups characteristic of this Department. This analysis is expected to provide resource information and guidance for both the Staff Development and Training Division and the Manpower Planning and Staffing Division of Personnel.

The motivating force behind the creation and development of this research function is the desire to promote effective and efficient use of this Department's manpower resources, both now and in the future.

BRIEF
TO
SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
Departmental Library
December 1968

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
DEPARTMENTAL LIBRARY

The present departmental library has been formed by the amalgamation of three smaller libraries, namely, the Northern Affairs library, the Parks Branch library, both of the former Department of Northern Affairs and National Resources; and the Indian Affairs holdings of the library of the Department of Citizenship and Immigration. These mergers took place during 1965 and 1966.

At present, the library supplies the need of departmental officers working in such fields as northern research generally, wildlife research, the social sciences, and historical research. The library also provides reference material to graduate students, both Canadian and foreign, who are engaged in research within our departmental areas of interest; for example, we have received requests within recent months from the University of Alberta, University of Calgary, Cornell University, Harvard University, Université Laval, University of Massachusetts, Michigan State University, University of Michigan, Moorhead State College of Minnesota, City University of New York, State University of New York, University of Saskatchewan, University of Western Ontario, York University, University of Wyoming, as well as from European scholars. One can see, therefore, that the library provides support for a wide range of scientific disciplines.

Although the library does not conduct research, it does fall in the scientific support category. Below are the answers to questions of the guideline most relevant to our operations.

2.2 Organizational Functions

- c) i) Reference and bibliographic services, research facilities and working space in the library are extended as required. Bibliographies in the subject field, and photocopies of material retained in the library are supplied on request.
- ii) and iii) *ibid.*
- v) Reference and bibliographic services are also extended to the public.
- d) Duties and goals are reviewed periodically by the chief librarian and the library board.
- f) A notable omission is the exchange of the scientific publications of our research groups with publications of like material produced by scientific institutions (government, university, private research institutes) of other countries. This exchange of information is a normal library function which this library should institute and develop.
- g) Lack of staff has been the basis of the deferral of this programme.
- h) i) Introduction of the exchange function. (noted above)
- ii) Introduction of automated techniques for information retrieval, ordering and circulation of periodicals, and, probably, other functions amenable to these techniques.

2.3 Personnel Policies

- c) In engaging professional staff, this is taken into account, and confirmation is made by observation of performance effectiveness.
- e) Intramural (language training) and extramural (library science) is available periodically.

2.5 Personnel Associated with Scientific Activities

- a) As of October 1, 1968, the establishment is as follows:
 - 1 Chief librarian.
 - 1 Reference librarian.
 - 2 Catalogue librarians (1 not filled)
 - 2 Contract librarians (part-time)
 - 6 Secretarial and clerical workers.
- b) One.
- c) Of professional positions currently filled, detail is as follows:

<u>Chief Librarian</u>	B.A. (English), A.R.C.T. (Violin) B.L.S. (Bachelor of Library Science) i) Canada. ii) Canada. iii) Canada. iv) 14 years; 1 month in present organization.
<u>Reference librarian</u>	B.A. (Modern languages and literatures) M.A. (Modern languages - French and Spanish - and literatures) i) Canada. ii) Canada. iii) Canada. iv) 14 years; 2 1/2 years in present organization
<u>Cataloguing Librarian</u>	B.A. (French and Art History) B.L.S. i) Canada. ii) Canada. iii) Canada. iv) 1 1/2 years; 1 month in present organization.
<u>Contract Librarian</u>	B.A. (English) B.L.S. (Bachelor of Library Science) i) Canada. ii) Canada. iii) Canada. iv) 8 years; 4 years in present organization.

Contract Librarian

Diploma in Library Science.

- i) Canada.
- ii) Canada.
- iii) Canada.
- iv) 40 years; 5 years in present organization.
- v) Average age of above 50
- vi) Percentage able to operate effectively in Canada's two official languages 40%.
- d) This library was instituted in 1965. Total number of professional staff:

<u>Years</u>	<u>B.A. or equivalent</u>	<u>M.A.</u>	<u>Ph.D.</u>
1965	3	0	0
1966	3	1	0
1967	5	1	0
1968	4	1	0

Estimated for

1969	5	1	0
1970	5	1	0
1971	5	1	0
1972	5	0	0
1973	5	0	0

e)	1965	33 1/3%	--	--
	1966	--	--	--
	1967	60%	--	--
	ii)	66 2/3%		
	iv)	66 2/3%		

Expenditures Associated with Scientific Activities

2.6 b) <u>Years</u>	<u>Operating and capital funds</u>
1962-63	N/A
1963-64	N/A
1964-65	N/A
1965-66	figures not available
1966-67	figures not available
1967-68	\$ 82,000

Committee on Science Policy

Bibliographies on the subjects listed below have been prepared, at the request of researchers, by the Departmental Library:

Abnaki Indians
The Alcohol problem and the Indian
L'Anse aux Meadows
Athabasca oil sands
The Canadian North
Community Development
Coppermine Region
Cree Indians
Eskimo arts and crafts
Eskimo dictionaries and grammars
Eskimos - general bibliography
Franklin, Sir John
Guaranteed minimum income
Huron Indians
Iceland
Indian arts and crafts
Indian language material
Indians of Canada - Education
Indians of Canada - General bibliography for junior high school students
Indians of Canada - General bibliography for senior high school students.
Management and personnel administration
Micmac Indians
Montagnais - Nascapsee Indians
Northern Saskatchewan
Nutrition of Eskimos and Indians
Ojibwa (Chippewa) Indians
Personnel management and personnel psychology
Records management
Recreation and parks
Sociological, economic, anthropological, psychological studies of northern peoples

2.5.c CHART I Library

B.A.'s and M.A.'s employed in the Library, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Country of Training	B.A. Canada	M.A. Canada
Secondary Schooling Canada	4	1
B.A. Canada	4	1
M.A. Canada		1
Able to operate effectively in both languages	1	1

2.5.c CHART II Library

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s and M.A.'s employed in the Library, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

Age Group	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization
21-25	1	1.5	.5			
26-30						
31-35						
36-40	1	14.0	.5			
41-45						
46-50	1	8.0	4.0			
51-55						
56-60						
61-65				1	14.0	2.5
65	1	40.0	5.0			

APPENDIX A
NEW
DEPARTMENTAL
ORGANIZATION

THE RE-ORGANIZATION - A GENERAL REVIEW

The Government Organization Act of 1966 brought about basic changes in the responsibilities of this Department. The Water Resources Branch and the Resources Development Branch were transferred to the Department of Energy, Mines and Resources and the Indian Affairs Branch was transferred to us from the Department of Citizenship and Immigration.

As a result of these transfers, the Department grew from an establishment of 4,252 man years to 7,536 man years, and from an annual budget of \$157.6 million to \$195.5 million. The merger demonstrated that, in so far as the Indian Affairs and the Northern Administration Branches were concerned, somewhat similar objectives were being pursued with respect to the indigenous people of Canada and that consideration should be given to the consolidation of common activities.

Temporarily, the organization structure shown on chart page 4 was adopted after the merger, in 1966, to replace the previous structure shown on page 2. This organization chart, except for a very few changes, still exist today. In this framework, the program responsibilities of the Department were as follows:

- Indian Program
- Northern Program
- Conservation Program
- Departmental Administration

These charts do not reflect certain other organizational responsibilities but it is important to mention them here. These include:

- Yukon Government
- Government of the Northwest Territories
- National Battlefields Commission
- Historic Sites and Monuments Board
- Northern Canada Power Commission
- Northern Transportation Company Limited

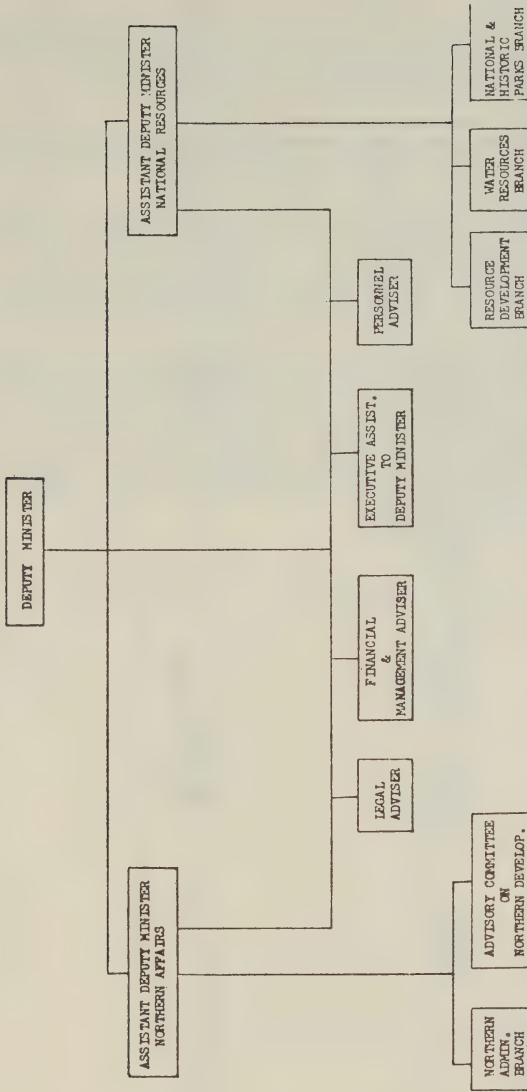
By the time the further devolution of functions to the Territorial government were to take place, sufficient time had elapsed to enable both elements (e.g. devolution of northern functions and absorption of Indian program functions) to be surveyed profitably.

A task-force was established in June 1967 to review legislation, objectives, policy, activities and existing organizational structures. As well, the task-force held discussions with Branch Directorates and the Executive Committee of the Department. Proposals presented by the task-force were further discussed with Treasury Board and the Public Service Commission.

The new framework recasts the organizational pattern in line with three specific and distinct departmental programmes with a strong support Services organization to serve them.

They are as shown on page 5.

- The Social Affairs Programme
- The Economic Development Programme
- The Conservation Programme
- and Departmental Administration, embodying all Support Services.

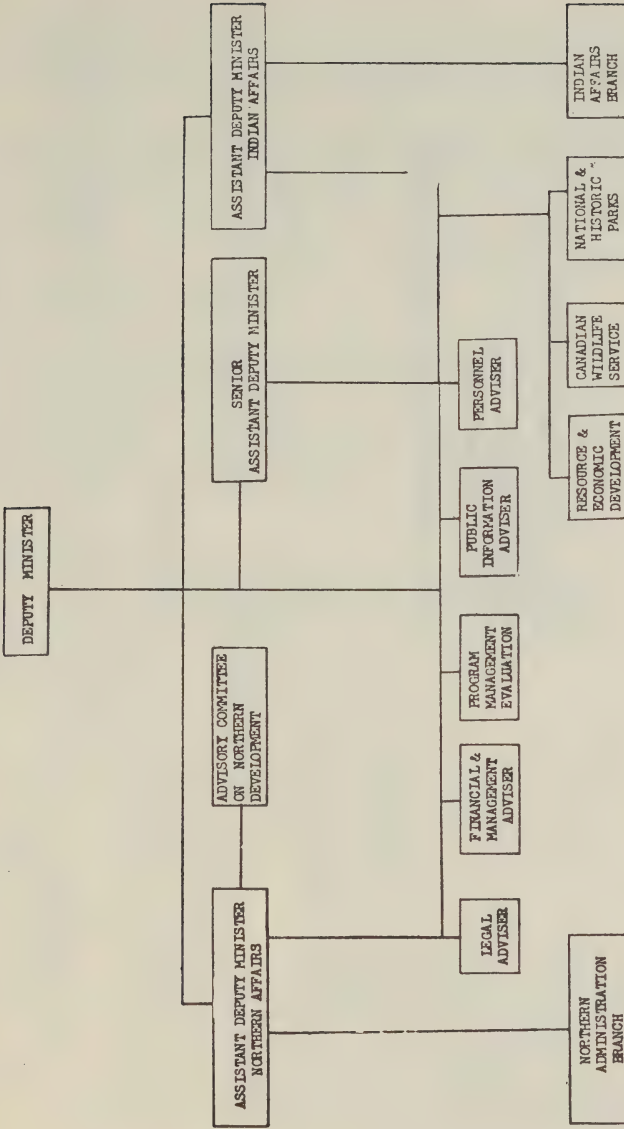


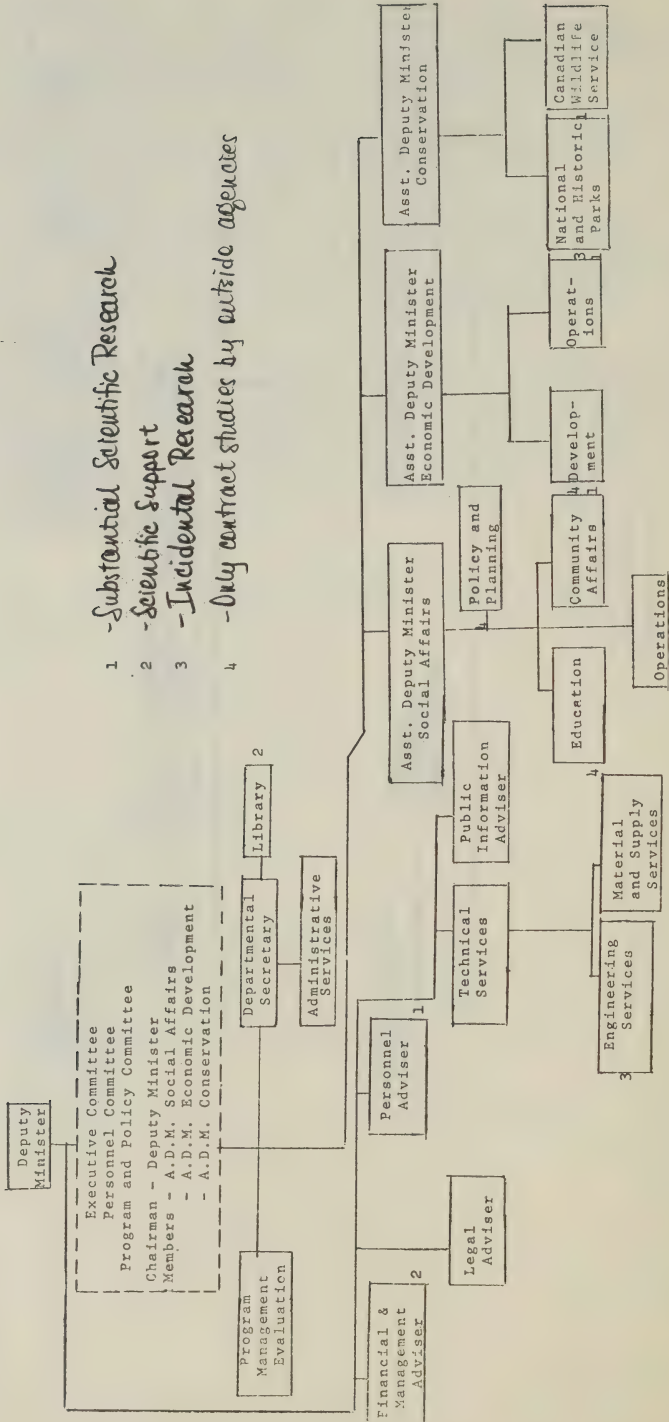
Each programme (Social Affairs, Economic Development, Conservation), is headed by an Assistant Deputy Minister, thus providing the necessary organizing, planning, directing and administrative authority to meet effectively the legislative responsibilities of the Department.

The Support Services, consisting of those under the Financial and Management Adviser, Personnel Adviser, Legal Adviser, Public Information Adviser and Director of Technical Services, report to the Deputy Minister.

The organization pattern also incorporates the principle of team management whereby the Deputy Minister is able to direct the operations of the Department through the committee structures shown on the chart. The committee structures are intended as the focal point for integrating and coordinating the complex requirements of the Department.

You will notice that this new organization structure places particular emphasis on policy, planning and programming. Where such elements are planned, the responsibilities are to review and define policy for specific programmes, develop long range objectives within specific legislative authority, and, where necessary, draft legislation to meet the re-defined objectives of the programme. Further, this organization must be in a position to evaluate the execution of the programs carried out.





- Substantial Scientific Research
- Scientific Support
- Incidental Research
- Only contract studies by outside agencies

1
2
3
4

SOCIAL AFFAIRS PROGRAMME

The objective and functions of this programme covers education, community development, welfare, social affairs, cultural affairs and Indian trust administration. (See chart page 8.)

The Programme will be directed by an Assistant Deputy Minister who will report directly to the Deputy Minister. The Assistant Deputy Minister will be responsible for planning, organizing, directing and administering the Social Affairs Programme. Organizationally, three branches will report to this Assistant Deputy Minister, each one headed by a director: education, operations, and community affairs. The Assistant Deputy Minister will also be seconded by a Policy Planning Programming organization formed by the group of the same name now part of Indian Affairs Branch.

The director of operations is responsible to the Assistant Deputy Minister for the effective and efficient direction of Social Affairs operations through the Regional Directors who report to him. In addition, the Indian and Eskimo Bureau will also report to him. The directors of the other two branches, Education and Community Affairs, provide advice and assistance of a specialist nature as well as providing functional direction to their respective staffs at Regional headquarters.

Education Branch

The Director of Education is responsible for educational research and development and school services. The Branch will merge the Education divisions of both Indian Affairs and Northern Administration Branches. Two new organizational elements will report to this director:

a) Educational Research and Development

This group will generally be responsible for carrying out the educational research studies in order that the Branch will be informed on all developments in this professional field. It will also be responsible for developing plans for the improvement and up-grading of the educational programme for the benefit of the indigenous people.

b) School Services

This group will be responsible for formulating and promulgating operational procedures for the direction and guidance of the educationalists in the regional, district and local schools. In addition, the group will review the school programmes and inspect the school operations to develop the understanding necessary to formulate effective operational procedures. It will also be responsible for the administration of scholarships and grants.

Community Affairs Branch

The Community Affairs Branch is responsible for the development of municipal government and for the development of programs which will ensure political, economic and social self-determination for the indigenous people of Canada.

The Director is assigned specific responsibility for co-ordinating and providing functional direction to the operational elements at regional, district and local offices. In so far as possible, responsibility and accountability are decentralized to the lowest level in the organization where effective operational decisions can be made.

The Branch will be a merger of the Social Affairs Division from Indian Affairs Branch and the Welfare Division from Northern Administration Branch. Two new organizational elements will report to the director: Welfare and Community Development:

a) Welfare

The Welfare organization is concerned with professional staff services. It is responsible for maintaining a close liaison with other federal departments and provincial governments on welfare matters. They will also maintain close contact with regional and field operations and be responsible for formulating and promulgating operational procedures for the direction and guidance of field staff.

b) Community Development

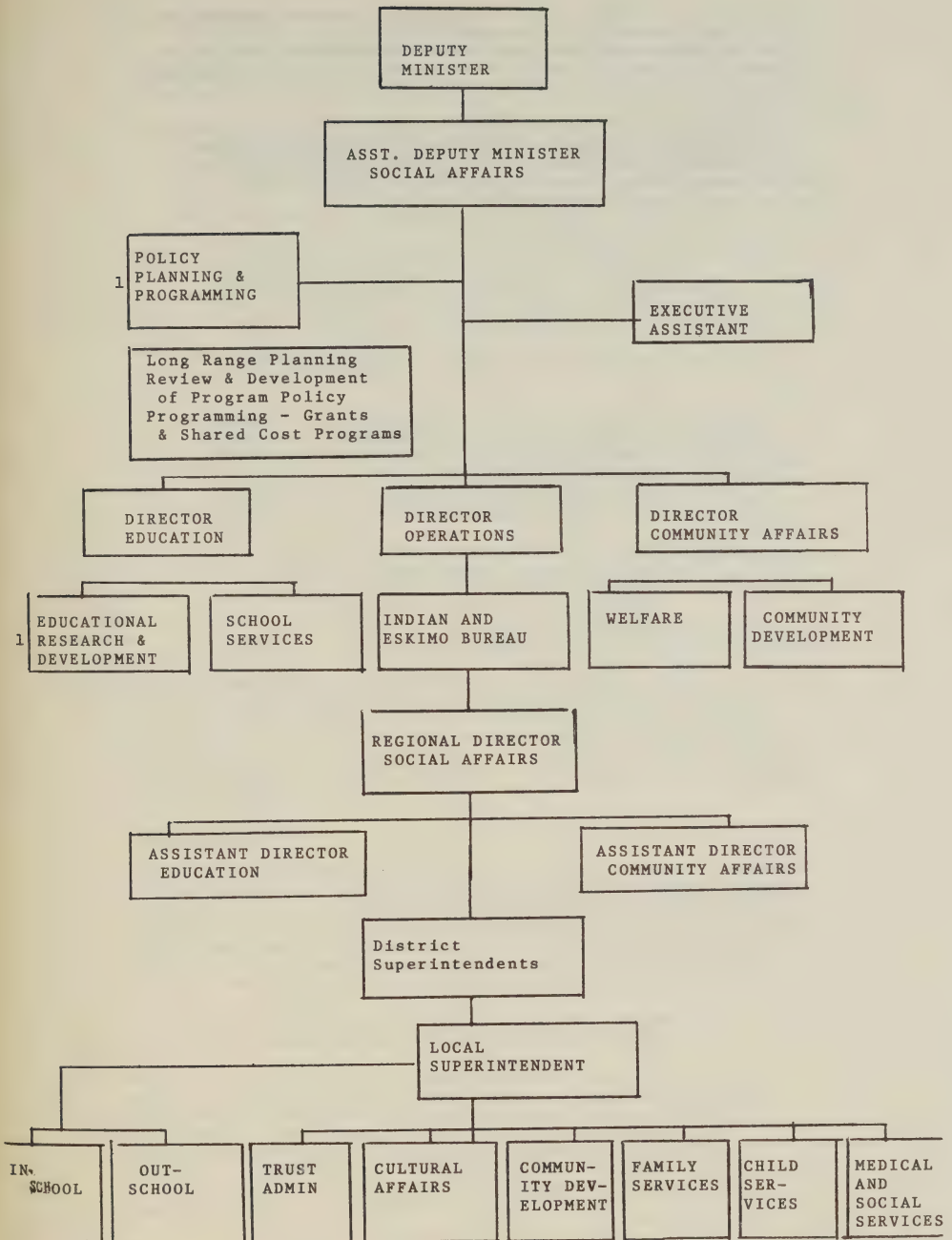
The organizational elements identified under Community Development include those professional staff services responsible for conducting research in all fields of human endeavour related to leadership, municipal government, self-determination, motivation, etc. Further, they will be responsible for developing plans and objectives for the Community Affairs Program in collaboration with representative groups of the indigenous people of Canada. It will also be their responsibility to maintain a close liaison with the Operations Branch, and the Policy, Planning, and Programming organization. This organization will also maintain close contact with the field operations and will formulate and promulgate operational procedures for the direction and guidance of staff on all matters relating to Community Development.

Operations Branch

As already mentioned, the Director of operations is responsible to the Assistant Deputy Minister for the effective and efficient direction of Social Affairs operations through the Regional Directors who report to him.

The Director of Operations is also responsible for the Indian and Eskimo Bureau. This Bureau will be formed by the Administration Directorate from Indian Affairs Branch, at the exception of Land Administration, Survey and Titles.

It provides administrative support and advisory services to Indian and Eskimo people and general guidance and direction in administrative field throughout the Social Affairs



NOTE: The detail shown below the Directorate level (Director-Education, Operations & Community Affairs) identifies functions & activities to be carried out and is not intended as a definite organizational structure.

¹-Only contract studies by outside agencies

Programme. It administers trusts and treaties; maintains the Indian estates; it provides administrative services related to Reserve lands and administers Indian Band Funds. It monitors administration of Federal grants and subsidies, and is responsible for Indian and Eskimo questions generally.

The Operations Branch will also include the Branch Financial and Management Adviser and the Branch Personnel Adviser from Indian Affairs Branch; the Finance section from the Development Directorate and the Federal-Provincial Relations, from Indian Affairs Branch.

ECONOMIC DEVELOPMENT PROGRAMME

The objectives and functions of this Programme cover the following.

- A. Major resource development and management in the Canadian North in the fields of mining, oil and gas, water, forests, roads and airstrips, and incentive programs.
- B. Departmental economic research and advice.
- C. Industrial development for both Indian and Eskimo peoples including stimulation of secondary industry, tourist development, co-operatives, small business, arts and crafts, fishing, wild crops, and industrial promotion.
- D. Land management as it relates to Indian Reserves and wet land acquisition.
- E. Territorial relations - The Department of Indian Affairs and Northern Development will continue to have responsibility for the management of territorial resources and related federal government functions, as well as for those residual functions of the former Northern Administration Branch, including:
 - (1) the monitoring of Territorial agreements,
 - (2) the development and up-dating of agreements (including financial agreements and development of formulae),
 - (3) providing for services which are beyond the resource capability of either Territory.

The Programme will be directed by an Assistant Deputy Minister who will report directly to the Deputy Minister. The Assistant Deputy Minister will be responsible for planning, organizing, directing and administering the Economic Development Programme. Organizationally, two branches will report to this Assistant Deputy Minister: operations and development (See chart page 12).

Operations Branch

The Operations Branch is formed by a merger of Lands Administration (including Surveys and Titles) and the Resource and Industrial Division (except Natural Resources and Minerals), both from Indian Affairs Branch, and the following components of Northern Administration Branch: the Secretariat, the Branch Financial and Management Adviser, Branch Personnel Adviser, Industrial Division, and the Territorial Division.

The new Operations Branch divides into two components: Territorial Relations and Industrial Development.

Territorial Relations manages Territorial relations and related Federal Government functions, as well as residual functions of the former Northern Administration Branch, including (a) monitoring of territorial agreements, (b) development and up-grading of agreements, including financial agreements and development of formulae, and (c) providing for services which are beyond the resource capability of either Territory.

Industrial Development is responsible for the stimulation of secondary industry, tourist development, co-operatives, small business, arts and crafts, fishing wild crops, and industrial promotion. As well, it has responsibility for land management, including Indian reserves and wet land acquisition.

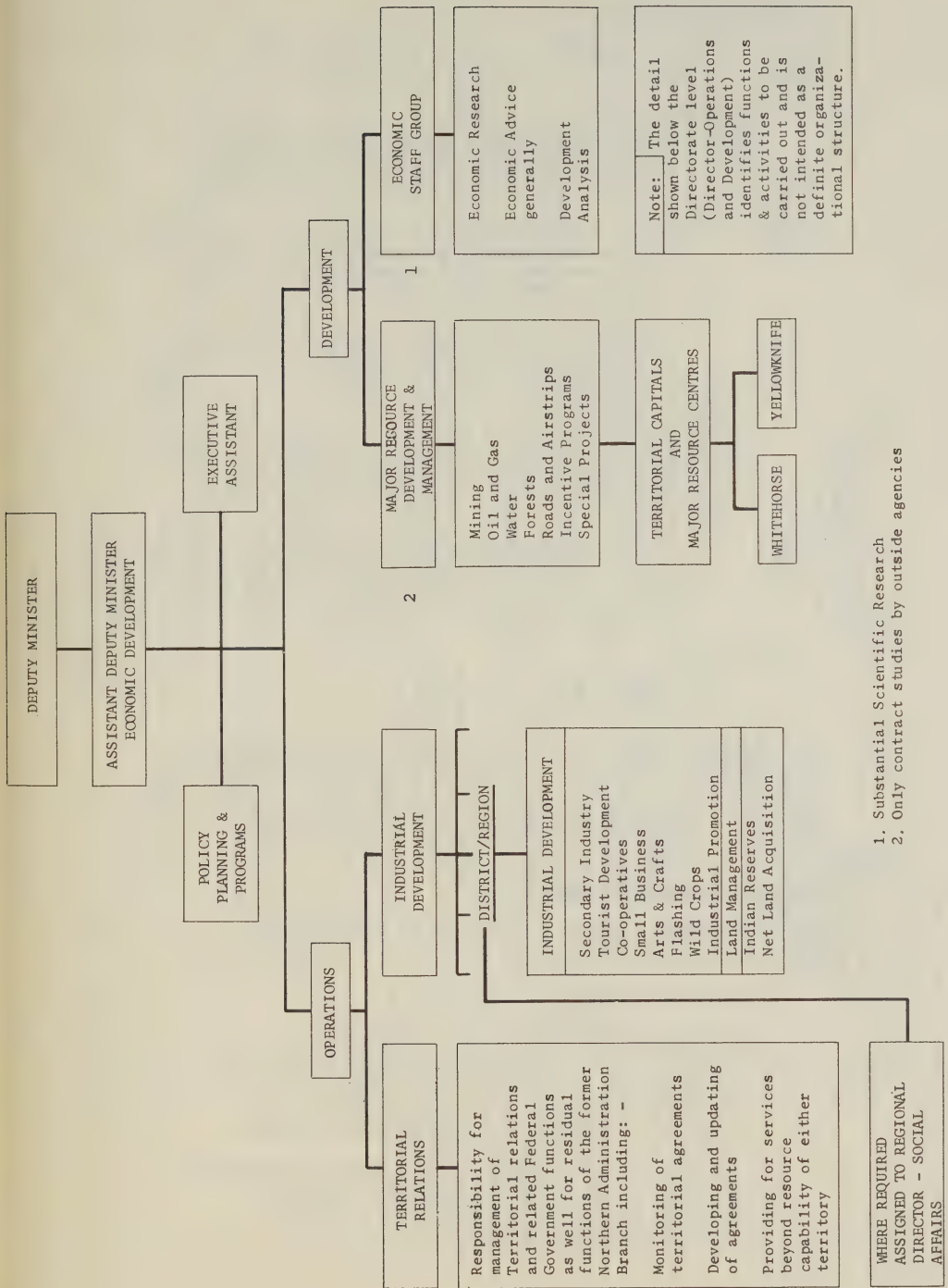
The Assistant Director in charge of Industrial Development will, through his regional staff, provide the specialist capabilities at the regional, district and local offices to assist the local communities on all problems concerned with industrial development, land management and resource management. The regional staff of his Assistant Director will be assigned to the Regional Director of Social Affairs for purposes of program co-ordination and policy direction. The specialist staff at headquarters in Ottawa will maintain close contact with the field offices and will assist these field offices through the formulation and promulgation of procedures for the guidance and direction of field staff.

Development Branch

The Development Branch is formed by the Natural Resources and Minerals from the Resources and Industrial Division of Indian Affairs Branch and the following components of the Resource and Economic Development Group: Administrative Services, Economic Staff Group and Resource Management.

The Development Branch divides into two organizational components, (a) Major Resource Development and Management, and (b) Economic Staff Group. Both organizations are staffed by specialists.

The Assistant Director responsible for Major Resource Development and Management will be involved with major resources in the Canadian North, including mining, oil and gas, water, forests, roads and airstrips, and incentive programs. He will direct these programs through the Territorial capitals and major resource centres.



1. Substantial Scientific Research
2. Only contract studies by outside agencies

WHERE REQUIRED
ASSIGNED TO REGIONAL
DIRECTOR - SOCIAL
AFFAIRS

CONSERVATION PROGRAMME

The Conservation Programme will have as functions and objectives:

A. National Parks

- (1) Formulation, review and up-dating of policy or policies designed to preserve and develop National Parks within the intent and framework of the National Parks Act.
- (2) Research and planning to identify most suitable features of Canadian topography, flora and fauna to be developed and/or maintained for present and future generations of Canadians.
- (3) Initiation and implementation of programs to provide services designed to enhance enjoyment by the public of National Parks.

B. Historic Parks and Sites

- (1) Archaeological and historical research to identify national historic values, the restoration and preservation of which would be in the interest of present and future Canadian generations.
- (2) Formulation of policy, plans, and the initiation of programs providing the most suitable restoration, commemorative development and visitor service facilities to permit appreciation by the public of the cultural and aesthetic values of our historical heritage.

C. Wildlife

This function will not change as a result of re-organization. (see page 15)

The Conservation Programme will be directed by an Assistant Deputy-Minister who will report directly to the Deputy Minister. The Assistant Deputy Minister will be responsible for planning, organizing, directing and administering the Conservation Programme. Two branches will report to this Assistant Deputy Minister: National and Historic Parks and the Canadian Wildlife Service. (See chart, page 14)

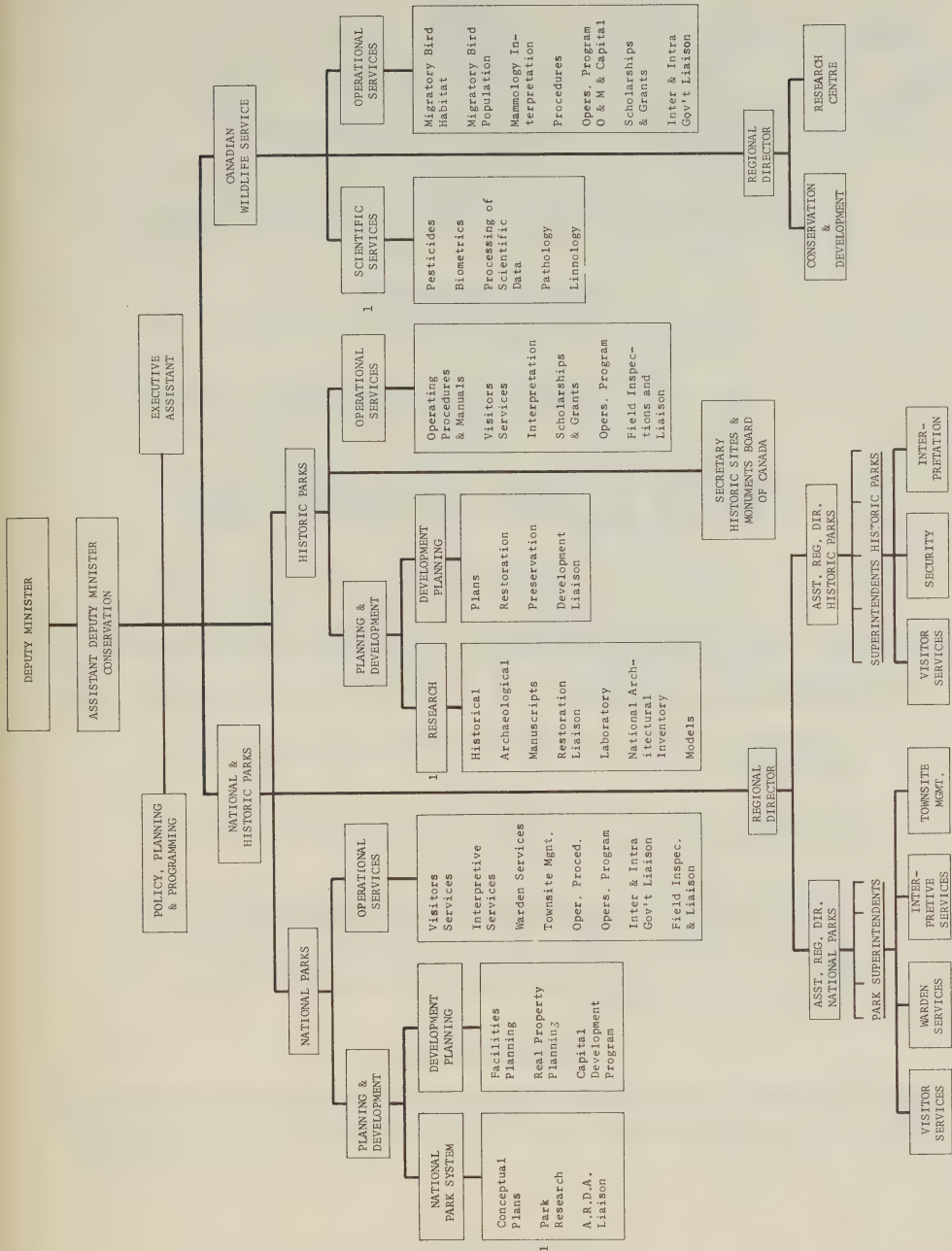
National and Historic Parks Branch

The organizational elements reporting to the Director of the National and Historic Parks Branch include (a) National Parks, and (b) Historic Parks.

a) National Parks

The responsibilities of the Assistant Director, National Parks, divide into two organizational elements, (1) Planning and Development, and (2) Operational Services. The Planning and Development element is further divided into: National Parks System and Development Planning.

The Chief of the National Parks System is responsible for conducting research on parks system studies designed to appraise requirements, plan park systems, appraise park trends and conduct liaison with various organizations.



1. Substantial Scientific Research.

The Chief of Operational Services is responsible for review and development of National Parks policies and programs, formulating and promulgating procedures for the guidance of Regional Directors and Park Superintendents in all matters relating to the operation of National Parks (i.e., visitor services, interpretative services, townsite management). This organization will also be responsible for inter- and intra-government liaison and for maintaining close contact with all field operations to ensure the maintenance of proper operating standards.

b) Historic Parks

The Assistant Director, Historic Parks, is responsible for two organizational elements, (1) Planning and Development, and (2) Operational Services.

The Planning and Development organizations is further divided into Research and Development Planning. The Research Division has primary responsibility in the fields of historic and archaeological research, manuals, restoration, laboratory and architectural inventory. Development Planning will include restoration, preservation and development planning and programming.

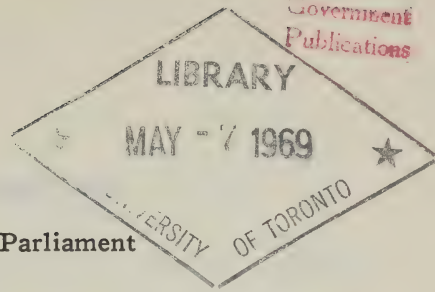
The Operational Service Division's responsibilities encompass policy development and direction, operating procedures and manuals, program planning and functional direction to regional headquarters and field staff in such areas as visitor services, interpretation, scholarships and grants programs.

Canadian Wildlife Service

The activities reporting to the Director of the Canadian Wildlife Service include: (1) Scientific Services and (2) Operational Services.

The Chief of Scientific Services will be responsible for conducting studies in all areas of scientific research related to the management and preservation of wildlife.

The Chief of Operational Services will be responsible for formulating regulations on all matters pertaining to management and preservation of wildlife and for formulating and promulgating procedures for the direction and guidance of regional and field offices. This organization will also carry out inter- and intra-government liaison and oversee the scholarships and grants programs.



First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS OF THE SPECIAL COMMITTEE ON **SCIENCE POLICY**

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 32

THURSDAY, FEBRUARY 27, 1969

WITNESSES:

*The Canadian International Development Agency: M. F. Strong, President;
G. P. Kidd, Vice President, S. S. Peters, Special Advisor; L. A. E. Doe,
Special Advisor.*

APPENDIX:

33.—Brief submitted by the Canadian International Development Agency.

THE QUEEN'S PRINTER, OTTAWA, 1969

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Thursday, February 27, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Carter, Grosart, Haig, Hays, Kinnear, and Robichaud.—7

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

M. F. Strong, President;

G. P. Kidd, Vice President;

S. S. Peters, Special Advisor; and

L. A. E. Doe, Special Advisor.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 33:

—Brief submitted by the Canadian International Development Agency.

At 12:20 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Strong, M. F., Mr. Strong was born in Oak Lake, Manitoba, April 29, 1929. He received his education in Oak Lake, Manitoba, and holds Honorary Doctorates from Sir George Williams University, Brandon University, the University of Calgary, the University of Guelph and the University of Ottawa. Mr. Strong is married and has four children. He is Past President of the National Council of YMCA's of Canada. He is a member of the Advisory Board, York University School of Business Administration; a member of the Advisory Committee, Institute of Northern Studies, University of Saskatchewan; a member of the Advisory Committee, Canada's National Hockey Team, Eastern Division; and a member of the Joint Committee on Society, Development and Peace (World Council of Churches, Geneva, and Pontifical Commission. Justice and Peace, Vatican City). He is also a Director of the Ottawa Roughriders Football Club. Prior to joining the Government in October, 1966, Mr. Strong's entire career had been spent in the business world, except for a brief period with the Secretariat of the United Nations in New York in 1947-48. He has held a number of positions in the field of finance, particularly related to the petroleum and mining industries. In 1962 he joined Power Corporation of Canada, Limited, firstly as Executive Vice President and Managing Director, and then as President. He also served as an Officer and/or Director of a number of other Canadian, U.S. and international corporations. On October 1, 1966, Mr. Strong became the Director General of the External Aid Office, Government of Canada, and resigned all former business positions. In September, 1968, the name of the organization and his title were changed so that he is now President of the Canadian International Development Agency and also serves as Chairman of the Canadian International Development Board.

Kidd, George P., Mr. Kidd was born in Glasgow, Scotland in 1917. He received his education in British Columbia; first at Brentwood College, Victoria, B.C. and then at the University of Victoria and the University of British Columbia, from which he graduated with a B.A. and later obtained an M.A. He subsequently received a Fellowship in Economics from the University of Illinois for further post-graduate studies. During World War II he served in the Canadian Army with the Cameron Highlanders of Winnipeg, Manitoba, and saw service in the United Kingdom and France. In 1946 he joined the Department of External Affairs and has served in Ottawa, as well as at Canadian Missions abroad in Warsaw, Paris and Tel Aviv. He has attended the course at the National Defence College in Kingston, Ontario, and from 1959 to 1961 was Foreign Service Member on the Directing Staff of the College. In 1961 he was appointed Ambassador to Cuba and concurrently Ambassador to Haiti. In 1964 he became Minister at the Canadian Embassy in Washington. On October 1, 1967 he was appointed Deputy Director General of the External Aid Office in Ottawa. In September, 1968, the name of the organization and his title were changed so that he is now Vice-President (Operations) of the Canadian International Development Agency.

Peters, Stuart Sanford, Ph.D., Dr. Peters was born on July 8, 1924 at Kingston, Ontario. He received his primary and secondary education in Kingston. During 1942 he joined the R.C.A.F. and served as a pilot in the European Theatre until hostilities ceased. Following his release from the Air Force, he attended Kingston Business College and joined as partner manager in the W. P. Peters Seed Company at Kingston. In 1952 he left the business to attend Cornell University and graduated in 1955 with a Bachelor of Science degree from the New York State Agricultural College at Cornell University. In 1955 he accepted a position with the Newfoundland Government as a biologist and where he conducted his post-graduate research for his Master of Science and Doctor of Philosophy degrees. In 1957 he was appointed chief biologist with the Newfoundland Government and in 1960 was appointed Deputy Minister of Resources with the administrative responsibility of Newfoundland's Forestry, Wildlife, Provincial Parks, and fresh water resources. He held this position until 1967 when he was appointed Director General of Planning for Newfoundland's Rural Economic Development Programmes. In 1968 he resigned to join the Government of Canada in his present position as Special Advisor to the President of the Canadian International Development Agency on energy and resources and on the development and co-ordination of activities with respect to the proposed establishment of the International Development Centre.

Doe, L. A. Earlston, Ph.D., Dr. Doe was born in Bermuda in 1916 and emigrated to Canada with his parents in 1923. He grew up in Ontario and graduated from the University of Toronto in 1938 with a B.A. degree in Philosophy and History. After teaching school for four years, he joined the Navy and served at sea until the end of World War II. In 1949 he obtained the degree of M.A. in Physics at the University of Toronto and joined the staff of the Fisheries Research Board of Canada as an Oceanographer at Nanaimo, B.C., where he did research on coastal and offshore waters of the Pacific. In 1952 he studied for his Ph.D. in Oceanography at New York University and received the degree with a Founders Day Award in 1963. During the years 1955-60 Dr. Doe was employed as an Oceanographer by Creole Petroleum Corporation in Maracaibo, Venezuela, where he conducted studies of Lake Maracaibo as related to the petroleum operations in the Lake. Returning to North America in 1960, he spent two years at Woods Hole Oceanographic Institution and joined the staff of the new Bedford Institute of Oceanography, Department of Mines and Technical Surveys, at Dartmouth, N.S. There, he was variously in charge of Research on Air-Sea Interaction problems, Head of the Oceanographic Research Section, and Acting Director. He also lectured in Physical Oceanography at Dalhousie University. In 1964 he obtained leave of absence and taught a course in Oceanography for UNESCO in Karachi, Pakistan. Since January, 1968, he has been Senior Scientific Advisor (Mines and Geosciences) in the Department of Energy, Mines and Resources. He is to be loaned by the Department to the Canadian International Development Agency for one year starting March 1, 1969, to assist in the establishment of the proposed International Development Centre.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, February 27, 1969.

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (*Chairman*) in the Chair.

The Chairman: Honourable Senators, I am very happy to introduce to you this morning Mr. Maurice Strong, President of the Canadian International Development Agency, which is the new name, I understand, for the former External Aid Office.

As you know, Canada is getting more and more involved in foreign assistance and in behind this new drive I think we have to recognize the efforts and the inspiration of Mr. Strong.

He is this morning accompanied by some of his colleagues; I do not have all the names here, but I would ask him before he makes his opening statement to introduce them to the members of the committee.

Mr. M. F. Strong, President, the Canadian International Development Agency: Thank you. Mr. Chairman and honourable senators, it is a very great pleasure for me to appear before this body today. I have followed the progress of this committee with a great deal of interest and I hope through the course of this morning to be able to outline the reasons for that interest.

I would like, in accordance with the suggestion of the chairman, to introduce to you at this point the members of my staff who are accompanying me here this morning:

Mr. George Kidd, Vice-President, Dr. Stuart Peters, Special Advisor on Science and Technology Matters; Mr. Lionel Bonnell, Director General of Administration and Finance; Dr. Fergus Chambers, Director of Planning and Economics Division, and Dr. Earlston Doe, who has been Special Advisor to the Department of Energy, Mines and Resources and who by their courtesy has been made available to act as a

special consultant to me in conjunction with Dr. Peters on science and technology matters.

The chairman has suggested that I continue at this point; inasmuch as the honourable senators have received a copy of my presentation I am advised by the chairman that I may proceed on the assumption that this need not be presented by myself at this point in detail.

I will confine my opening remarks to a relatively brief statement of the role of the agency within government and the role of science and technology within the agency.

As the brief points out in more detail, the Canadian International Development Agency is the agency through which the Canadian government conducts its programs of assistance to the developing countries of the world.

As president of the agency I report to the Secretary of State for External Affairs and subject to his direction am responsible for the administration of the program. The program consists of three main components, or two main components really, that are directly part of the program. The first is our program of bilateral assistance, whereby Canada provides direct assistance to developing countries. That assistance flows to a total of something in the order of 60 individual nations or territories, but something over three quarters of it goes to about 12 main countries or areas.

Considering the Caribbean as a single unit, the number would be 12, so in that sense our program, while reaching a large number of countries, is in fact concentrated in a relatively few places.

The other component is the multi-lateral program through which Canada makes its contributions to the various agencies that are primarily part of the United Nations system, the World Bank, the United Nations Development Program, the Asian Development Bank, are those which figure most prominently in the development assistance business, although important contributions are also made to and through other United Nations agencies as well.

These programs, of course, are not operated by us, but are included in our overall aid budget and are generally responsible for the coordination of Canada's contributions to these various agencies from the development assistance point of view.

The third component that is included in the figures that are normally quoted when people are referring to the total aid flows are the figures for export credits. The export credits are not considered as part of our aid program; they are administered by the Export Credits Insurance Corporation, which is a completely separate entity, a Crown corporation that is part of the structure of the Department of Industry, Trade and Commerce. The export credits, to the extent those credits go to developing countries are, however, counted in the international figures prepared by the development assistance committee of the OECD, showing the relative performance of each of the donor countries in their provision of assistance, and for this reason export credits are normally included in the totals that I would refer to as being part of our aid program, but I wanted to make it clear that the administration of that program is quite separate from that of our main aid program.

Those, then, are our three main programs. I have been asked to indicate the level of our assistance programs and I will do that without going at this stage into a great deal of detail.

The bilateral programs in the 1968-69 fiscal year totalled \$233.7 million of which \$127.7 million was given in the form of grants and \$106 million in the form of development loans.

Under our multi-lateral program we allocated a total of \$57 million so \$26 million was in the form of grants and \$31 million in the form of loans or advances. This amounts in total to \$290.7 million, which is the amount that you can say was allocated for what we regard as really development assistance.

The other \$60 million which is included for the purposes of arriving at the overall figure that permits comparison with the figures of other countries is \$60 million for export credits, which would bring the total for 1968-1969 fiscal year to \$350.7 million.

During the year too there is an allowance for repayments of \$19.7 million under the category of export credit which, if those were deducted, would bring you to a net figure of \$331 million.

As to the role of our agency in the field of science and technology, we are not, as is pointed out in the brief, specifically designated as a scientific agency for purposes of government administration but I think it is apparent from any analysis of our program or any analysis of the problems of the developing countries that science and technology must and do figure very prominently in the requirements of the developing countries for assistance at this point in their history.

They also figure very prominently in our attempts to provide that assistance. While we have not had up to this point a program within our total operation which we could segment out as being specifically a scientific and technological program, almost every aspect of our program in one form or another does draw upon Canadian scientific and technological resources and capabilities.

In the past two years we have been undertaking a very intensive special series of studies on the specific role of science and technology in the developing world generally and more particularly as it affects the role that Canada might play in meeting the needs of the developing countries.

We have had as part of this process the benefit of advice from a very great many sources, a large number of individuals who are leaders in their field in Canada and elsewhere. We have also had the benefit of very detailed consultations with many of the international agencies, governmental agencies like the World Bank and the UN system, as well as private agencies, universities, such organizations as the Rand Corporation, the Brookings Institute, the Ford and Rockefeller foundations, the centre for democratic studies in California and various European agencies. So we have made a rather substantial effort to come up with some form of inventory of the needs of the developing countries and made some kind of an appraisal of the extent which Canada might, especially through mobilizing its own scientific and technological community, make a special contribution to the developing countries.

We have included in our presentation copies of two of the special papers prepared to us as part of the series of studies that I have referred to: One of them is a paper by Dr. Irving Brecher, Director of the Centre for Developing area studies at McGill University; the other is a paper by Dr. Geoffrey Oldham, who is one of the key people in the science policy institute of Sussex University in the United Kingdom and who has acted as a consultant to us on these matters.

These papers are presented because they do cover the subject in a rather broad way and do indicate to you some of the directions in which our thinking is being influenced.

I would point out that they are papers prepared by the authors and are included here with their permission; they do not necessarily represent our views, but this is the kind of thinking to which we have been exposed in the process of formulating our views.

The Chairman: You do not accept the general Parliamentary rule that when you quote a document you have to prove it.

Mr. Strong: I was not familiar with that rule, Mr. Chairman.

Senator Grosart: Mr. Chairman, I think the rule is that you have to table it and I think it is tabled.

Mr. Strong: We felt though that they would shed some light on the kinds of activities that I have been referring to. Many of these things are not very provable, as you well know from your own interest in the subject and the intensity and amount of exposure you have had to these things in recent weeks. Some of these matters are controversial domestically; they are no less controversial internationally, I assure you.

I think, Mr. Chairman, I should not take any more time of the committee with my initial presentation; I would much prefer to respond to the particular requirements of the members of the committee.

The Chairman: Thank you very much, Mr. Strong; now we will have Senator Grosart to initiate the discussion.

Senator Grosart: Thank you, Mr. Chairman.

Mr. Strong, I should say we are confronted this morning with a Morris and a Maurice, for both of whom I have a high regard and both of whom I have known for quite a while. It is a pleasure to welcome you here Mr. Strong, and may I personally congratulate you on what you have done since you took over what was then the External Aid Department.

I think I can say that Canadians generally, those that I know who are particularly interested in this aspect of our foreign affairs, are very proud of what you have done and what your department has done, not only from the beginning, but also since you took over. I will try to keep my questions related specifically to the science policy aspect although, of course, I know there are many other aspects of the CIDA's operation that interest us all greatly.

I would be particularly interested, Mr. Strong, if you could somehow separate out specifically your expenditures and operational activities in the area of what I will call inhouse research on your own operating efficiency in the science policy area?

I am aware that there are really two aspects of this. One is the actual, what Professor Brecher calls "transplanting" and what Professor Oldham calls "transfer" of science and technology resources from Canada to the other countries.

You have documented that very fully in your brief, but there is not too much documentation on your own self-inventory.

To what extent are you analyzing the transfer of our scientific and technological resources to these countries in terms of the need of these countries or,

if I may put it another way, how are you matching your science policy to the science policy of the recipient countries?

Mr. Strong: Senator, first of all let me thank you for your very kind remarks; I hope in future we can try and justify this kind of confidence.

The Chairman: This is probably a precedent which has been established by Senator Grosart this morning.

Mr. Strong: A comment like that is always a prelude to a very penetrating question and the Senator has asked a very penetrating question.

The general answer to the question, Senator, is that in the past and at the present moment all of our assistance to developing countries is provided at their request and is only provided in respect of programs which they themselves want to undertake.

However, it has to be admitted that neither the receiving countries nor the donor countries have had a great deal of experience or have developed a high degree of sophistication in the evaluation of the conditions under which assistance from outside can make its optimum contribution to internal development.

We have had, as you know, something like 18 years or 19 years since the inception of the Colombo Plan. Really we are just beginning now to have the kind of experience that is susceptible to meaningful research and we have provided in our new organization for special evaluation procedures; we have instituted within our agency a very much more strenuous planning process, which involves much more in-depth study of any proposition, whether it be one which involves science and technology, most of them do to some degree, or a more simple operating type of proposition. We have been employing outside experts to send them into the field to do detailed studies and investigations of projects before we have undertaken them; we have engaged in a much greater degree of consultation, not only on the official, administrative level, but much more on the technical and scientific level, preceding decisions to implement particular programs.

I think a good example of this might well be in the task force that we sent to India last year. We recognized, of course, as the total world development community recognizes, that the problems of Indian agriculture are very crucial to the future development of that subcontinent.

We had been emphasizing agriculture in many aspects of our program up to that time but we were not really satisfied that we had a sufficiently clear understanding of the recent developments in the field of Indian agriculture, of the kind of things

other people were doing in India, of the real gaps that had been identified by the intensive work in the areas of science and technology in the last few years, particularly those which related to development of the new high yield varieties of wheat and rice and the problems which surround the implementation of that development.

We formed a task force of leading Canadian agricultural scientists as well as some marketing people; we sent it out under the direction of Dean Bentley, Dean of the Department of Agriculture of the University of Alberta. They did a very intensive study of the state of Indian agriculture, particularly related to the state of Indian science and technology in the agricultural field. They had detailed discussions. This was not just a very quick mission, there was intensive preparation and they were there for several weeks and had detailed discussions with their counterparts in the various areas of Indian agriculture.

They came back; they made detailed recommendations to us which we have since worked out with the Indians and have formed the basis for an agreed program, or at least the framework for an agreed program through which Canadian resources can be focused specifically on high priority development needs within the Indian agricultural sector.

This we are doing in a number of other fields, but this perhaps illustrates the increased degree to which we are accentuating the need for in-house research in respect to our own programs before they proceed.

Senator Grosart: Is the consortium arrangement between the donor countries zeroing in on this problem of the technical audit of science and technological requirements of the recipient countries?

Mr. Strong: Various institutions are concerned with this; there is a special United Nations committee set up on this and it has done a considerable amount of work. We are quite familiar with that work.

I would like to ask, if I may, Dr. Stuart Peters, who is familiar with this in considerable detail, to answer the question.

Dr. S. S. Peters, Special Advisor, the Canadian International Development Agency: Senator, in this again we are working closely with Geoff Oldham, who we consider a leading world expert in science policy and in the manner of the approach, the methodology of bringing the target area to recognize their needs, to upgrade their science and technology capabilities so that they in fact can look at the world and know what they can do and how better they can help themselves.

It is one of Mr. Strong's policies, of course, to improve this capability and one of the proposals of the International Development Centre.

Mr. Strong: I wonder, Dr. Peters, if you would specifically refer to the new United Nations Committee on Science and Technology.

Dr. Peters: This is where they have in fact identified protein as one of the world needs and have proposed, subject to further review, a world plan of action. This is the type of program identification that we are paying very close attention to in connection with our own proposed programs. One really need not run out of proposed projects or ideas from such sources for probably twenty years if their work stopped now.

This group (under the Economic and Social Council of the UN) has addressed themselves to world problems very vigorously.

Mr. Guy Gresford, who is an Australian gentleman, is director of this committee, and we have had meetings with him to be brought up to date because we wanted to be sure that due to the scarcity of expertise in this whole field we do not spend a lot of time duplicating or reinventing ideas that have already been well analysed by such people as are in his committee at the United Nations in this field identifying worthwhile programs for countries such as Canada to address themselves to.

Senator Grosart: I see two real problems here: One you have already mentioned, Mr. Strong, the limitation of the response factor in our philosophy of external aid; the other one would appear to be the multiplicity of donor countries.

How limiting is the response factor and should we maintain it as part of our policy? Perhaps I can just go a little farther than that and say that the problem there as I see it is that, I will not say Canada has no science policy, but we have not one that is too visible at the moment. It seems obviously that many of these countries have not...

The Chairman: The vision is blurred.

Senator Grosart: ... have not a science policy of their own. Now, if we reply on the request from a country that has really no conception of its own science and technological needs, how can we hope to fit our science and technological transfers viably into these economies?

Mr. Strong: With regard to the matter of whether we should change our policy, I am sure the senator would realize that this is not something on which I can comment. However, if I may answer the question in this way, I think it is certainly apparent

that the old adage that if you know the question you are already well on the way to the answer certainly applies in the aid and development business.

It is true that if we were to sit back inertly and simply wait for everybody to identify their needs and respond only on a mail order basis to the requests that we receive, the quality of our program could well be relatively low. We do not interpret responsiveness quite in that way; we interpret it in this way—that we should create a very active dialogue with the receiving country—with the cooperating country—and that out of that dialogue our input is basically our ideas and our assessments of the kind of resources that we might be able to make available to them.

Their input is their understanding of their own particular problems, of their own particular needs and, of course, of their environment, the cultural, physical, political and social environment in which the resources must be brought to bear on the needs.

Now, our whole process of evaluating any kind of project or proposal that we make, arises out of this dialogue. In the field of science and technology, however, there is another possible and I would think desirable modification to the way in which this policy is carried out.

This would require us to have the power of initiation in at least one sense, in at least the sense that we might well identify, let us say, as Dr. Peters has referred to it, the protein problem, or some aspect of the protein problem.

Let us say we were to follow the lead of the United Nations Committee on Science and Technological Development and identify the protein problem as a significant problem to which we might address our attention. I could conceive that it would be, it could be very desirable and not necessarily be offensive to the policy of responsiveness, that we might do a considerable amount of work on that problem here before anybody had asked us to do it.

We might then decide that in Canada we had in fact certain resources and special capabilities in this field that would permit us to do some very useful things in the developing countries.

Having got to that point, having got to the point that we now say, okay, this is a special area of interest to us and we do have special capabilities in this field, the next step would be to apply these within the developing country's setting.

At that point, of course, it is pretty apparent that you could not hope to carry on a program of that kind effectively except in any country that wanted you to do it. You could let it be known that you had these capabilities, that you were interested in

making them available and out of this process it is extremely likely that one or more of the countries with which we have a cooperative aid relationship would be quite happy to see us initiate a program.

If it were done in this way it would not seem to me at least to violate the spirit of the policy of responsiveness.

Senator Grosart: How close are we to having an international inventory of technological requirements in recipient countries? For example, how close are we to knowing what the technological requirements are of Lesoto or Grenada?

The reason I ask this question is that in this committee, Mr. Strong, we seem to be faced with the evidence that even in Canada, with all the planning resources we have had, we have now an obvious imbalance in our input of funding into science and technology.

How can we avoid having the same thing happen in these recipient countries?

Mr. Strong: Senator, I can only give you a general answer to that. I think in part this answer is underscored by the knowledge that 95% of all expenditures in the field of science and technology are still made in the wealthy countries of the developed world and only 5% approximately in the developing countries, so it is pretty apparent that many problems which we have are being experienced to a much greater extent in the developing countries.

Offsetting that, of course, is the fact that they do not have in many instances the same kind of established institutionalism and established difficulties. Like in many other field, the fact that they start from so close to zero has a certain advantage, which does not entirely offset the disadvantage, but does perhaps create a more receptive environment to new forms of approach, new approaches that may be apart from the conventional approaches that we have adopted in our own society.

Another partial answer to that question, Senator, lies in the fact that our own view, not my view—I am expressing a view which has emerged from this process that I described and not necessarily one which originates with me—is that our approach to the developing countries has got to be based on identifying problem areas and then determining the ways in which existing knowledge can be best brought to bear in solving those problems.

A very good example of this is the Ford and Rockefeller foundations' approach to the grain problem. As they described it to me it went something like this: They simply sat first and said what is the principal problem of the developing world and the answer was to feed them. Okay, what is the principal

food in these countries? Well, obviously food grains were very great.

In the case of south east Asia, if I may use that as a particular example, the principal food was rice.

The next question was, well, how do we increase the production of rice? Can we do it by expanding the acreage? That obviously offered very limited possibilities. How do we expand the yields?

Once you got to that point, as they described the process to me, they said, okay, let us find out what technology is available in this whole field of rice production; what has been done and what is being done now which might be useful in finding a key to the problem of increasing rice production?

So they got an inventory of the existing technology in that particular area; then they found out that while there was indeed a great deal going on in this field there was no single institutional entity that had the task of focusing existing resources on the specific problems of increasing rice production on a large scale.

So in 1961 they created a new institution called the International Rice Research Institute which, with the agreement of everybody concerned, were into the business of increasing rice production. Its function was very clearly to take the existing technology and to supplement it with new technology and to bring that technology to bear in a very specific way on the problem of increasing rice production.

I think, as you may know, that the results have been very spectacular with a relatively small expenditure of money on the high yield grain program, including the wheat program. They tell me that the total expenditures are something less than \$30 million, some 10% of what we allocate in our aid program in a year.

The Chairman: By how much was the yield increased?

Mr. Strong: Over many areas the production has been doubled, so the multipliers from this process have been tremendous.

Now, of course, if they had started the other way, by taking a general survey of all scientific knowledge and a general survey of all scientific needs, it might have been years before they might have isolated a particular problem, but by looking at the problem first and saying that that is a priority problem and then looking at the resources that could be brought to bear on the problem and setting up a mechanism for relating those resources to the problem they made an important impact in a fairly short time scale.

Senator Grosart: On the other hand, this may be to some extent begging my question, because problem orientation is fine, but it begs the question of what is the problem.

For example, in this area we went along for years, everybody seemed to believe that the answer for developing countries was to step up industrial output.

The concept of suddenly zeroing in on agriculture is comparatively new, so obviously the whole principle of aid to these developing countries was wrong for many years.

The Chairman: I would not say that.

Senator Grosart: I am merely saying that this is the view I get from fairly extensive reading.

The Chairman: Because I believe it is just a comment, Senator Grosart, but I believe that Mr. Strong is very right. When you start increasing the productivity in the field of agriculture at that level, then you certainly create a problem of unemployment in those regions, which brings you back to your industrial structure.

Senator Grosart: I agree that we may be right in zeroing in now on agriculture. The evidence is probably that we are, but this does not discount the fact that this concept is comparatively new. All the studies that went on in the early days of international aid did focus, if my facts are right, on stepping up the industrial output.

This zeroing in on agriculture is a comparatively new thing, so I say to some extent you are begging the question when you say we just look around and everybody agrees this is the problem. The scientific approach is to say, are we sure that this is the problem?

Mr. Strong: Senator, I did not mean to imply that this was the basis on which everyone agreed. This was not the case; I was describing a process which the Ford and Rockefeller foundations, private institutions, went through on this problem. They did not have to get agreement from a great many governments. That was one of the advantages that they brought to the situation.

Senator Grosart: Should I then not be alarmed when I read on page 3 of your brief this statement:

... there has been no framework within which we have been able to plan our programs to ensure that the most effective use is made of these resources.

There has been no program; now, should I not be alarmed at this statement?

Mr. Strong: I think it is a genuine basis for concern and this is one of the reasons why we included it; it is true that there is no reliable framework of total information.

The Chairman: And research.

Mr. Strong: And research.

The Chairman: In other words, what Canada has been doing up to now and more and more of it recently fortunately has been to more or less have in your office or in your service scientific advisors who are not doing research but they are using their knowledge in advising you, or a developing country, on projects.

They are also using the scientific and technological knowledge in Canada to help in carrying out projects abroad, but there has been up to now really no research on all these projects, very little at least.

Mr. Strong: We have been able to tap sources of research that are available to us internationally and through other institutions. We have not had our own inhouse research program, but this is not so much the lack that I understood that you were referring to, Senator, but rather the framework.

The total framework that we are referring to here is the framework which basically consists of the information within the developing countries, as well as the mechanisms for evaluating that information internally.

The whole development process, not just for us, but for the entire international community, is so new that one of the real problems of research is to get reliable data accumulation over any meaningful period of time to permit you to do what is really a scientific research job.

It is the absence of that kind of framework that has concerned us.

Senator Grosart: Are we going to get this kind of framework? For example, in this field it seems to me that everybody has been misled by perhaps the finest commentator on the field, Barbara Ward. However, she worked along for years on the theory that the way to upgrade the economy of the developing countries was to follow the pattern of western European development. Everybody was fooled by this, I think, because she made out such a very good case.

I am concerned about the lack of a framework because in this area of science and technological development within a country and particularly in the transfer aspect, the danger of waste and wrong starts and so on is so great that I wonder if we are going to get a reasonably good framework internationally?

I am not suggesting that Canada should do the whole job, but are we going to be able to do it?

You say, for example, that you have nobody on your staff who is specifically engaged in scientific activity.

Mr. Strong: Scientific research as such.

Senator Grosart: Scientific research activity; does this mean that nobody is researching your own policies?

Mr. Strong: No, sir. I want to give Dr. Peters a chance in a moment, but on that particular subject though, I was trying earlier to describe the process by which we do make a detailed analysis of our own programs, what you might call operational research, but I make quite a distinction between that and what I call fundamental scientific research.

We do not engage in what you might call basic or fundamental research. We do engage to a significant degree in what you might call operational research. In that sense we do have a framework.

The Chairman: It is a kind of scientific appraisal of projects.

Mr. Strong: Yes.

Senator Grosart: I say this because we so often hear this statement made, and I am not saying it is true, that in the whole international aid program we are so often doing the right thing in the wrong way. This is a comment that one comes across all the time; I am not saying it is true.

Mr. Strong: If I may venture to say, Senator, I think it is at least equally true that we are very often doing the wrong thing in the right way.

Senator Grosart: Yes.

Dr. Peters: There was just a point that I thought might be useful while listening to the dialogue between you two gentlemen, and that is that there is a growing awareness from the recipient area of aid of their needs.

No longer do the developing countries want a dialogue on economic principles. They have many competent staff members, some of whom are extremely well qualified and able to challenge many of the principles and theories of industrial development and so on, but I think we are also becoming sensitive, or tuned in on these sensitivities and I feel we are now responding to this new awareness.

This is quite evident in sitting in on discussions on science policy. Now, that is a big term and has a huge umbrella of meaning. I have recently been an

observer during discussions on some of these developmental topics at the Development Centre of OECD and at UNESCO, where capable scientists are getting down to meaningful discussions, and from an inter-disciplinary approach are realizing that some of the past development principles are no longer valid.

We are establishing a dialogue with people from these target or recipient areas, and I think this business of a new sensitivity to science policy is to in fact work with these people in a quiet and effective way, to assist them in bringing their capability for dialogue up so that they can talk to us on a better level.

Not understanding the need for early discussion is probably why some of the performance of western technology has failed. They do not want us to carry on a discussion on economic principles; they want to know why some of the industrial activity built on western technology is not working. Is it too sophisticated?

Then you can get into another field of discussion sir, ranging in the subject of intermediate technology which is the special interest of Schumacher and his group in England.

This area of interest is sometimes criticized because it is too unsophisticated, but I think eventually all these viewpoints will meld into good policy, and already many developed countries are getting their heads together in concert with underdeveloped areas.

Senator Grosart: Mr. Chairman, I would hope that perhaps before the end of the session one of our witnesses might just run down Professor's Oldham's very, very interesting list of requirements, which appears at page 6, where he asks the specific questions: How should science planning be related to economic planning; How can the most appropriate technology be identified; How much of the technology should be imported; What is the best organizational framework for science; How can the effectiveness of the recipient country's science system be improved, and so on.

To me at least it would be very interesting if on the record there were some comments as to the Canadian reaction to these very interesting specific questions concerning the scientific approach to the continuing technical audit of our own efficiency in these transfers of science and technological resources.

I am sorry, Mr. Chairman, that I will have to go to another Committee. I do not like to eat and run, or as you might put it, to hit and run.

The Chairman: Would you care to make some comments on these general points?

Mr. Strong: As I made a comment earlier, Mr. Chairman, in another context, knowing the question is at least part way along towards the answers.

At this point we have been concentrating more on knowing the right questions than we have on getting all the answers. I think it has to be said that in many of these areas nobody really has all of the answers; there has been a growing and I think a very healthy awareness of the fact that the old simplistic ideas of aid, the simple transfer of resources and the simple transfer of skills, is just wholly inadequate. They have given rise in many instances to negative results, even to relaxation of essential disciplines in the recipient countries themselves. The whole process of helping another society creatively and constructively is far more complicated and raises far more questions than was ever realized in the old simplistic days, when some ambassador sent a telegram saying that the foreign minister of so-and-so wanted to know if Canada could build a bridge somewhere.

If we were capable of building bridges and had a budget for that area and everything else was fine and we could get the miscellaneous approvals required within the government, we would build a bridge.

Now, we realize that that kind of simple transfer while it does have its place, is not the real answer that these countries, these societies are seeking to endow themselves with the innate capabilities that we have found, that have permitted us to produce the kind of wealth required to provide a decent standard of life for our people.

It is really the secret of how they can provide themselves with these tools in ways which do not compromise the cultural and social values which they hold to be important, which we have got to help them with.

There are a lot of other things we can do that are more simple and it may be that we will have to continue for many years to do some of the things the effect of which we may even doubt at this point because I think it is going to be a long time before we get ultimate answers to all these questions.

Many of these ultimate answers will simply arise from a process of experimentation, trial and error.

With all the best will in the world, with all the pre-project research and evaluation that you do, you are never going to be able to anticipate all of the conditions under which success or failure may take place.

The important thing about this is that it represents the attempt to become realistic about what we can do and what we cannot do; the attempt to use all of the knowledge; the attempt to use all of the brain

power that we can bring to bear on these problems in our attempts to help them to solve them.

It is a very new field and I would think we will still be debating these things many decades from now, but I think we have by the very fact that policymakers are beginning to recognize that aid and development is not this simplistic give-away type of thing that everybody thought it could be, the very fact that they are recognizing this and that this recognition is now expressing itself in terms of the policies of agencies around the world charged with administering aid programs, is itself a very constructive and forward looking development, which I think will yield answers to questions of this kind.

The Chairman: As far as I am concerned I am very glad to see that at least somebody and a greater and greater number of people are beginning to ask questions. That is an improvement, but it seems to me also that we should have the proper institutions as we go along to provide the answers, at least to provide provisional and tentative answers.

Do we have those research institutions now at the international level? How are they coordinated and what have we been doing in Canada within your own area of responsibility to begin to provide answers?

Mr. Strong: Mr. Chairman, what we have been doing, of course, is to be making the inventory that I referred to earlier of what is really going on in the rest of the world and we have found, and Dr. Peters will elaborate on this, that there is a great deal going on; there are a great many international institutions.

I think that is the total number of research institutions of some kind or another, some are pretty rudimentary, that are registered with the OECD and participate in its annual conferences on research centres in the developing countries even, there is much activity.

Dr. Peters: Yes, those however actually put emphasis on training, rather than research in that context.

The Chairman: How many are dealing mainly with research, because training, of course, is important, but this is an operation?

Dr. Peters: That is right and, Senator, this definition is not clear in the literature available to make this assessment. This is part of what we are now doing but have not got very far into it. It is very difficult to get published information on these institutions regarding what is research and what is education from the applied point of view. I believe this is what you are asking?

The Chairman: Yes, applied development and research, not only in problems related to improving

technology, but also related to another field which I am quite sure is very, very important in those countries too, how to improve the social environment for growth.

Dr. Peters: The problem of identifying institutions engaged in program oriented type research directed to the development needs is very difficult at this stage. The information I have at the present time makes it impossible to determine how many institutions there are.

The Chairman: There is no study being done by the United Nations, or by any other organization, or OECD, in an attempt to see, given that kind of situation and multiplicity of so-called research institutions, what are the duplications and the gaps and all this?

Mr. Strong: Yes, there has been and there is going on at an accelerated rate, fortunately, a good deal of international work in this area.

Probably the highest level policy group that has dealt with this is the United Nations Special Committee on Science and Technology. In effect it is the committee on the application of science and technology to development problems. They have met for a couple of years; they had hearings; they had presentations; they concentrated more on identifying the kinds of things that were needed than they did on an inventory of existing resources.

There is no place at which there is a central inventory of resources; I would say probably we have, as a result of studies that we have done in the last two years in this area, as much information on this subject now, Mr. Chairman, as really anyone in the world and we find others are coming to us now.

So it is pretty obvious that a great deal more work must be done; a lot of work has been going on at the development centre and the development centre of OECD. We have the Vice-president of that organization coming here in the next few days on this subject. We have been making frequent visits back and forth and we are coordinating our efforts very closely with them.

I think we are in touch now with pretty well every group that is doing anything of consequence in this area.

One of the decisions that is going to have to be made by the international community before too long is where some of this work should be concentrated. It is obvious to everybody that proliferation of institutions and overlapping and duplication of work is the last thing we need.

The Chairman: Coordination especially and concentration so far as gaps are concerned, but I do not

think that you might convince some of these institutions just to disappear.

Mr. Strong: No, I do not think there is any question of that; there is such a vast need in this area that some of the institutions are going to disappear because they are not adequate to meet these needs of a much more complex and demanding period that we are entering, but there is no question that new institutions are necessary. Just as Ford and Rockefeller found, there were many institutions dealing with problems of rice production, there were really none that had the capability and the resources to focus specifically on the problems of applying the technology to increasing rice production in south east Asia.

I think we are going to find this to an increasing extent, that it will be necessary to create new institutions, but my hope is that there will be a sufficient degree of consultation amongst those who allocate resources to ensure that new institutions that are created do jobs that are specialized, jobs that are not being duplicated elsewhere, so that all of us with our obviously inadequate capabilities in relation to the need are doing those things that we are most capable of doing and we are doing them within an overall framework—the framework that we point out is now missing—an overall framework which permits each party that has resources, to use those resources in the most effective way.

I think that the best that can be said then is, that while it is true that there is not any adequate framework internationally at this point in time, there is a very strong awareness of the need for it and that the people involved in the various international institutions and agencies who have the general responsibilities in this area are aware of this need and are now in the process of trying to decide how best to meet it.

The Chairman: It seems to me that the inquiry we are conducting now within Canada should be done by someone else, at the United Nations level, or OECD level, in order to try to find out the kind of situation which exists now and to what extent it is confused and provides for duplications and gaps.

Mr. Strong: I think, Mr. Chairman, that you will find a great deal of interest in the international community in the hearings that you are conducting here and in the results of those hearings.

The Chairman: Well, I may want to come back later to this, but Senator Carter has a question.

Senator Carter: I would just like to follow up a little stage further the question raised by Senator Grosart about when Mr. Strong spoke about the concentration on the rice problem in south east Asia.

Now, we have been having hearings in the foreign affairs committee and our inquiry has been focused mainly on the Caribbean countries, where there is a lot of poverty and they are underdeveloped.

We have been told that when these countries get to the point where they become politically independent and begin to have some say in the management of their own affairs, recognizing their own poverty they immediately turn to industrialization as the short cut to riches. That has been more or less the trend in all developing countries; once they become independent they seem to regard industrialization, and to concentrate on that as the best way to raise their standard of living and to narrow the gap between them and other countries.

Is this trend a new trend that you are talking about, this concentration on a specific problem, or is this something that just applies only to this particular area, or this particular problem? Is this a general trend now in all the developing countries, that they are beginning to see that industrialization is not the answer and they have got to concentrate more on the use of their own resources?

The Chairman: I hope that they do not come to that conclusion too soon. I am sure, for instance, that Mr. Strong is aware of the situation which is developing in Kenya, where they have improved the yield in the field of agriculture.

This has not improved the standard of living; the population has gone out and now they have less employment on farms, so people are moving to the cities and they have nothing to do there.

Mr. Strong: Senator, I used an example in reply to Senator Grosart's question that happened to be in the field of agriculture and indeed it is in this field where the most dramatic changes have taken place in the last couple of years or so. This has come about as the result of the fact that it has been generally recognized, both in the more developed countries that are providing assistance, and in the developing countries themselves, that agriculture had been in the past somewhat neglected. It is now getting a great deal of attention.

I think it would be just as wrong to forget about industrialization and I did not mean to imply in any of my remarks that the same kinds of techniques, the same kinds of scientific and technological resources and techniques, should not be applied to the process of industrialization.

I think that while it is true that perhaps industrialization was over-emphasized, it is equally true that a higher degree of industrialization is going to be necessary in these countries; the two things just go hand in hand and the two are going to require immense application of technological scientific resources.

The Chairman: In other words, you say that we need a global approach within which this kind of specific and problem-oriented approach should be applied?

Mr. Strong: Yes, because we have limited resources; there is no question about that. We cannot do everything.

When I say 'we' I mean 'we' collectively, including the donors and recipients, collectively have to decide what the priority problems are and bring their resources to bear on the problems. Some of those problems, some of the more urgent ones, have been in the field of agriculture and will continue to be in that field; some will be in the field of industry and there will be a lot of other ones too in the general fields of education, but one of the very things that perhaps these countries might learn from our experience, is that science and technology if it is applied in an unplanned way can lead to many very serious imbalances within a society.

This is already happening to some extent in the developing countries; it is happening, of course, at home here as well.

Senator Carter: In the developing countries as well.

Mr. Strong: Exactly; this is why it seems to me at least to be extremely important that in the developing countries, both from the point of view of limited resources and from the point of view of ultimate results, we have to look very, very carefully at planning our approach, not to the point of imposing ridiculous bureaucratic rigidities on what we are doing, but rather of constructing a broad framework within which each of the participants understands what the objectives are, what the possibilities are and what the limitations are.

Senator Carter: I would like to carry this just one stage further before I come to the other questions: Yesterday in the Banking and Commerce Committee we had a witness, Mr. Vandenberg, I think his name was, of Massey-Ferguson who, as you know, make agricultural machinery.

In the course of the examination it came out that down in south east Asia, in this very place you are talking about the rice problem, his company had developed what he called a primitive plough. It had to be primitive because it could not be sophisticated; they would not know how to operate it.

So that raised a question to me, to what extent is your agency trying to involve private business in solving that type of problem?

Obviously this company saw this problem itself and just out of sheer enterprise, they could make

money I suppose, they went and produced this sort of primitive plough.

That is an example of what can be done I think on a much larger scale if you gear private enterprise into these problems, and I am wondering just what are you doing along that line?

Mr. Strong: It is our policy and our practice now to involve private enterprise to a much larger extent in our overall operations.

We have provided in our new organization for the setting up of a special division for this purpose.

However, I would have to say that specifically in the area of research, and the application of scientific and technological knowledge we do not have a specific program, because what we have been doing in the last two years is undertaking a study of how this could be done, undertaking a study of what the needs are, what the resources in Canada are and what the institutions are internationally to which we must relate and with which we must coordinate.

In the course of this we have consulted very widely with private enterprise and it was my hope that if the government decides, I think as it has said in relation to this international development centre, to set up a special program under which we would be permitted to use some of our resources specifically for application in the fields of science and technology. I would hope that such a program—and I think that very largely it would be fully consistent with existing policies—would include a very strong element of participation on the part of private business.

Senator Carter: Thank you.

I come now to your brief. On page 10 you outline a field in which Canada has a special know-how:

Canada is in the midst of a rural-urban-industrial transition and therefore Canadians are fast gaining experience in the problems of 'development' . . .

Of all these fields this is where we are or should be expert.

Now, does it turn out in the experiences we have had so far that we are actually expert in transferring our know-how in these particular fields? Are these the fields in which we have been most successful in other countries in technical transfer?

Mr. Strong: This is true generally; whether you could say from that that we are experts in transferring our know-how is another question.

I would say that Canadians have done a notable job internationally in transferring their know-how under very difficult circumstances. Very few people

could consider themselves, I think, experts in the transferring of know-how.

It is in this area that a great many of the doubts and questions are now arising, this whole area of the transferability of know-how.

While I think Canadians do an extremely good job on this, there is all too little known at this point about the factors that affect the transferability of know-how. The man who knows how to conduct himself as a human being in his relationships with the people with whom he is working in a donor country can do a tremendous amount to accomplish a job without necessarily evoking a lot of conflict, but that does not necessarily mean that what he has accomplished, although it has gone smoothly, has been the best thing.

It may well be that the man who gets into conflict with the local people, who does not do as well in terms of his human relations, may nevertheless have a more lasting impact. We just have not had as much experience as we need to have to be able to say that we are experts on transferring know-how, but we have had a lot of experience.

I think that in each of these fields there are a number of Canadians that probably can qualify as much as experts as anyone else could in the world.

Senator Carter: Do you see any shortage of Canadian personnel, or do you go outside of Canada for personnel in projects like these, when they are not available in Canada?

Mr. Strong: Our policy is to use Canadian resources; in using Canadian resources we use Canadian personnel. That is not to say that on occasion a contractor may not have on his staff someone who is a non-Canadian, or even that on occasion we would not provide, under direct contract without our agencies, the services of a person who is not a Canadian citizen, but normally that would be a very exceptional case and the person involved would normally be one that was very much needed for a particular priority project and in the case of a direct contract would have to be a person who was at least a landed immigrant and had the intention of becoming a Canadian.

Senator Carter: I think Dr. Peters will probably understand; I may not be able to make myself clear to all of you, but I am sure Dr. Peters will understand what I am driving at.

The Chairman: I hope we will join you at some stage.

Senator Carter: You talk about when you are working out programs you have got away from the old concept where somebody says we want a bridge,

and you will go and build it and we are trying to do something more basic to the development of the country itself, but you obviously have got to try to work out with the government concerned of that country, and you get your idea of what is needed, I suppose, from them, your first concept of what the problem is, you get that probably from the government of the country concerned.

Now, to be successful you have got somehow to make it work with the people, the people who are going to benefit.

I think Dr. Brecher lays great stress on this, the necessity for social economic analysis, particularly the social scientific analysis of the problem.

Now, that means somehow making the people themselves, not only the government, aware of the problem, or aware of the need, but the people themselves and why I said Dr. Peters would understand this is because in Newfoundland where we have a lot of undeveloped regions there is a tendency for government or somebody to initiate a program, or a university or an extension program, and say here is a program and out we go and plant it somewhere, but the people themselves are not aware of the need; it never comes to fruition.

How do you overcome that problem? How do you make your program effective by getting down to the grass roots, where your efforts have got to take hold in order to bear fruit?

Mr. Strong: This is a very real problem and it is one of the problems that I would hope that a special program in the field of science and technology would help us to deal with, because as a government agency we must work through the government on the other side.

We cannot as a government necessarily insist on going beyond the point in an investigation where the cooperating government is willing to permit us.

We can always turn down a project, but there are problems of normal diplomacy in our relationships with them that do make it difficult sometimes for us to get down to the grass roots.

We get around this to a considerable extent by sending out special experts who are not government employees, but who are out there as experts to research the particular problem and the particular project, and they are able to operate to a much greater extent on a grass roots level and to identify what you might call the grass roots issues.

But there is no question that this is a difficulty; it is a difficulty abroad just as it is a difficulty at home, but it is a difficulty that we are attempting to deal with.

I think the general quality of our program is improving in this respect; I think the extent to

which projects have been researched in the way I suggested is growing. More and more projects are being undertaken on the basis of this kind of research and, of course, with the best will in the world the research cannot put you in a position where you have foreseen every difficulty, but at least we are doing this kind of research in advance of undertaking projects and this is addressing itself to the problems which you describe, but I cannot say that the problem has been resolved satisfactorily; it is a continuing one.

The Chairman: Before I ask Senator Hays to ask his next question, I would like to comment on this specific field, because I feel that we would need very badly in Canada the studies of technological transfer.

We were told, for instance, by the department formerly headed by Senator Hays, the Department of Agriculture, that they had not made yet any study, or at least, any serious study of the transfer of the results of research in the Department of Agriculture from the Department of Agriculture to the farming community, and I think it would be very interesting if they were to do this, because perhaps the research effort which they are making, which is tremendous, might have a much greater impact on the Canadian community and in your own field that it has at present.

Senator Hays: Mr. Strong, first I can think of no one more qualified to do the job that you are doing; first you went over there and saw the problem as an ordinary citizen and you know these problems of developing countries probably better than anyone else.

Each time I visit these countries I become more completely confused as to the problems in so far as how we are to handle these problems and I often wonder if your department would not be one of the main departments of government that could help with the science policy in so far as suggesting the things in the field of research where we should be playing a larger part.

I think of electricity, and the field of insecticides, of pesticides, transportation, which seem to me to be great problems in our own country and great problems in these particular countries.

I think in the field of agriculture of course today's solutions are always tomorrow's problems, and when you think that India hoped to be, in so far as food is concerned, self-sustaining by 1972, and Kenya, which was mentioned this morning, which now has a surplus of a couple of million bushels of wheat that they cannot sell and they cannot use, are there other fields of research that we should be doing, or that you can suggest to the National Research Council or the Secretariat that we should be spending more time on?

The Chairman: Or the Department of Agriculture.

Senator Hays: When I think about Dr. L. H. Shebeski, if he does as well in the next eight years as he has done in the last eight years, we are not going to be exporting any grain, that is for sure, it will be kaput, it will be out.

I do not know whether people realize this or not, but these are some of the fields; of course, your problems in these developing countries are probably the climate more than anything else.

I am sure if you put a good amount of Canadians in Kenya, they would all be the same as the Kenyans in 15 years; I know I would. I would not want to do any work, nor would I have to. I would have eight wives and that sort of thing. At one time it would have appealed to me.

The Chairman: But you do not have to either at present, even in Canada.

Senator Hays: But I wonder in the field of research if your department is not better able to suggest some of the things that we should be concentrating on in so far as priorities and that sort of thing are concerned?

Mr. Strong: Senator Hays, I certainly appreciate your remarks and your confidence; I think we really have a limited, very limited capability in the field of science ourselves.

Our agency is primarily charged with knowing what the problems are and developing mechanisms for identifying Canadian resources, identifying the needs of the developing countries and bringing the two together.

Now, in that sense I think we can and are playing a part in the shaping of Canadian science policy, because as the science council indicated in its report, it feels that the provision of assistance in the field of science and technology to the developing countries is a priority and we are very pleased that they feel this way.

I can tell you that the other organizations within the government, the Department of Agriculture, the Department of Energy, Mines and Resources, the Science Secretariat, the National Research Council and others concerned generally with science have cooperated very closely with us. Some of them have made people available to us in some instances.

The Science Secretariat is engaged very, very closely with us right now in the whole matter of providing an inventory of capabilities in Canada and relating this to capabilities that exist in international institutions and to the gaps that exist in the developing countries.

We get a great deal of cooperation and help and we need that cooperation and help because we are not ourselves a scientific agency. We are, as you can see from some of the people in this room and some others who are not here, endowing ourselves more and more with scientific capability, but this capability within our agency will not likely make us into a scientific agency; it will simply give us the ability to relate more effectively to these other agencies.

The Chairman: To be a better user.

Mr. Strong: Exactly, and that is really what we are.

Now, however, the development centre that the government has indicated it intends to establish would be a separate institution and it is very likely that any such institution would have specific responsibilities in terms of utilization of scientific and technological resources in the developing world.

The Chairman: Without revealing any secrets, could you explain further this project as it stands now, without getting into trouble?

Mr. Strong: I find myself under a handicap here. The matter is not yet before Parliament; I think I would have to confine myself to the kind of observations that have already been made by ministers about this project. They have indicated that it would be a separate institution, that it would be international in the scope of its activities, but Canadian in its basic sponsorship. They have indicated that it would have resources available to it under our aid program to permit it to focus specifically on the application and adaptation of science and technology to the problems of the developing countries.

I do not really believe I can go beyond that, although it is pretty apparent from the things we have said I think in our brief and the general thrust and direction which we envisage as an agency for any program in the field of science and technology, I would think that the government in deciding specifically on the setting up of the International Development Centre would take these considerations into account.

Senator Hays: Do you have any, or could you suggest any priorities, knowing the problems and knowing even as it would affect Canada industrially in the future and I think of electricity as one, whereby it seems to me that without a great deal more electricity in many of these developing countries they are completely hopeless in the field of storage and all this sort of thing, that we should be concentrating more on more research in the field of electricity and know-how, air conditioning, and all of these sort of things.

The Chairman: Are you referring more specifically to nuclear energy?

Senator Hays: Maybe; in this whole field.

Mr. Strong: A question such as electricity, of course, is an important one; however, it is not so much in the study that we have done today looming large in the requirements of new technology. It is mainly the requirements of the developing countries that in this area as we see them at this point seem more to be in just the acquisition of new capital facilities that are already feasible with existing technology.

However, in such fields as water resources where we, of course, have big problems and also, of course, significant capabilities, this is a profound problem in many parts of the world.

The Chairman: But are not the two connected, nuclear energy and the dissemination of water?

Mr. Strong: Yes, there are connecting points, but in terms of ground water resources, for example, in India, one of the problems identified during the visit of the task force was the whole problem of ground water and its relation to the utilization of the new high yielding varieties of wheat and rice, because they need irrigation.

The existing information on water tables led to indiscriminate drilling of wells, for example; there is not an adequate amount of information in many parts of India.

Senator Hays: They would lower the table, dissipate it?

Mr. Strong: Yes, and the spacing of wells, all these kinds of things. There are certain elementary things that really have to be known if you are going to make effective use of ground water resources and, as I understand it, Dr. Doe might wish to comment on this, I am very much a layman.

The Chairman: But before going into this, what do you think about the future of nuclear energy in those areas related to the process of providing water, the dissemination of water?

It seems to me if these projects are technologically sound that they would offer what we call in our own jargon as economists, the greatest multiplier effect for these countries; it would provide water, which they need very much. It would also supply a source of cheap electricity, I hope, which would prepare the groundwork for further industrialization in balance with their growth in agriculture.

So it would seem to me that with the Canadian experience in that field this would be a field in

which we could invest a lot of money with great advantage to these countries.

Mr. Strong: My only impression, and Dr. Doe might wish to comment further on this one, is that while the desalination of water using nuclear energy is now technologically feasible, it is still, except in areas of extreme density, very unlikely to become economic.

The Chairman: In the United States we are told it is becoming more and more competitive.

Mr. Strong: I agree; I understand this too, but I had a discussion the other day with the president of our own atomic energy corporation and we delt this very subject. He indicated that because the Canadian process generates a lot of heat our reactor is a pretty good reactor to be used in this area but that because, of course, we in Canada do not have much need for producing water by this process, we have not got much beyond that.

The Chairman: But we could have a lot of reactors to sell, or perhaps to give; the only ones we have exported up to now, we have given.

Senator Hays: In these developing countries is electricity not, if you are going to even change their culture, a very important part of it?

It seems to me that it is between transportation and electricity, which are two of the great problems of these countries.

Mr. Strong: Absolutely, Senator, but I distinguish here though between programs which are designed to improve existing capabilities using existing technology and those which are designed to do something new, to solve an old problem in a new way.

Our present program emphasizes to a very major degree hydro electric power and nuclear power. We are building a nuclear power plant for power generation now. We have provided one in India.

The Chairman: And Pakistan.

Mr. Strong: Yes, and some of the major projects that we have carried out have been in the electrical field and we will continue to do this.

These in fact do use technology, but what I am trying to get at is to the extent that our studies have made this information available to me there is not too much suggestion at this point that we need a lot of new research in this area.

Is it true that some small package units in villages, this kind of thing, have some promise, but the existing technology makes that possible; there is not

much new that is not possible to do on an operational basis in these places; it is really a matter of capital.

Senator Hays: You think the technology is there if we could apply it?

Mr. Strong: In the field of electric power transmission, generation and distribution as I understand it, and I am not an expert in this field, is an area in which improvements can be made, but where the application of existing technology will resolve most of the problems.

I do not mean to say that there is no problem at all in the area, but the kind of thing where we can see special interest in this area is use of nuclear methods of radiation for food.

Here is one of the great problems of these countries; it is not just to grow the food, but to store it and to use it properly.

Senator Hays: This goes back again to power, does it not?

Mr. Strong: Power is a factor in everything here; without power we cannot do many of these things.

The Chairman: You are powerless.

Mr. Strong: That is right. No, there is no question about the importance of power, but our research program is designed really to look at the gaps and to look at the areas where we need new technology, where existing technology is not good enough to solve a problem, but in the field of power the technology and especially Canadian technology is very highly developed at this point and existing technology is able, from what I understand from the experts, to cope with most of the problems that arise.

Senator Hays: Just recently now, taking Canada for instance, with 250 million bushels of damp grain, we know now that during the winter when we have temperatures below 40 degrees or something, if it does not get warmer than 40 degrees we can store it now with 20% moisture. This is a storage problem, then we do not have to use insecticides; they just do not grow at that sort of temperature and these are the great problems in the developing countries, the storage, and I am wondering if further in the field of research in so far as electricity is concerned that you go on to storage in that sort of thing and the application that you can use with electricity.

In the fields of Kenya you are not going to get a native there to drive a tractor until you air-condition it, because it is a lot easier to sit under a palm tree.

Mr. Strong: This is quite right.

Senator Hays: It seems to me that maybe in the vast area of energy we are doing enough work, but we are not doing enough research in the smaller field of doing these sort of things.

Mr. Strong: I could not agree with you more, Senator, in terms of the application and identifying specific problems, but again I come back to what I call the problem solving approach.

We just cannot afford the money or the resources to look at all the things that we might do, or to get all the people who might want to do something to do the things that interest them most.

The kind of program we envisage is a kind of program that says the problem in Kenya is that the natives will not drive tractors and because they are not driving tractors Kenyan agriculture is suffering. That is the problem, so we work back from there and say what is the answer? The answer may well be to air-condition the tractors, but this is the direction from which we would approach the problem I would think in any program of this sort.

The Chairman: But do you not think that you have really two basically different types of programs, programs which apply or are aimed at improving the situation and the productive capacity of individuals?

Mr. Strong: Yes.

The Chairman: That is the first category; of course, you will always face at some time at least a kind of unfavourable sociological social environment, so that all these programs will be quite difficult to implement until the social environment changes.

Then you have the second category of programs which deal with the basic economic infrastructure like, for instance, energy programs in order to improve the basic structure of the economy, where you do not really deal with the individual.

The individual will eventually get the benefits of this and then through this process the social environment will change and improve.

So that it would seem to me that we should not neglect this second category of programs because they might be more expensive to implement, but on the other hand they will have great impact and they will be much more easily applied in the kind of social framework that exists at the moment.

Mr. Strong: Yes, Senator, I agree with this and perhaps I make too much of a distinction between operational research and the kind of research I envisage in a specific scientific and technological program.

In the field of the latter example that you mentioned, what I call operational research, if we are going to build a dam in an area, we should know not only how to build the dam, but we should look at the society in which the dam is being built, the impact on the people in the area, the kind of social hazards that are going to develop as a result of this, the way in which these problems might be dealt with.

All of this is a matter of doing very good research of a nature involving social and cultural considerations as well as economic and technical considerations, but this should be part of running a good aid program.

In other words, even in doing the standard things, the things that you have the technology to do, you have got to do a much better job than we perhaps have done in the past of taking all these other factors into account.

I make some distinction between that though as the kind of problem that looms as a very major problem that does not seem to have an answer, or does not have a good answer, where you are saying how do we solve that kind of a problem; how do we get the people on to the land or how do we prevent them from going into the cities; or how do we get them onto the tractors?

The kind of problem that is fairly general; you might look at it in a specific instance, but it would have to be a fairly significant problem to justify a determined effort to solve it.

Senator Hays: Do you feel then that in this field Canada is doing enough research, in the field of electricity?

Mr. Strong: Oh, no.

Senator Hays: Or is this one we should give high priority to?

Mr. Strong: I think the use of electricity has got to be a fundamental part of anything that we do, but I have a fair amount of confidence from what I have seen; that our problem is not one of developing new technology, but of developing new applications for the technology we have.

The Chairman: I am not too sure that you are right there. Perhaps I am talking too much this morning, but the members of the committee can always protest.

Coming back to this problem of nuclear stations related to the production of electricity and also the production of water, in so far as I can recall the atomic energy people when they were before us did not seem to be very much interested in this.

Mr. Strong: No, that is right.

The Chairman: On the other hand, and I was just given the figure a moment ago saying, I suppose that is an estimate of the American costs at the moment, 20 cents per thousand gallons, which is competitive I am sure with the cost of water in the areas which are reasonably provided with fresh water at the moment.

Dr. Peters: This could only be economic from a potable point of view, from human use; it is not cheap enough for industrial use.

The Chairman: But in any case it seems to me that we should certainly as a country, since we have that much uranium to export and we have developed this kind of special vocation in the field of nuclear technology, in connection with our aid program, do much more research in this field so as to arrive at a solution before the Americans.

Mr. Strong: Senator, this, of course, is a fundamental policy which I can only comment on in a more or less generalized way.

I think that this poses the question of whether we should concentrate on doing those things that arise out of our own experience, whether internationally we should be doing those things which have some basis in our own experience at home and where that experience perhaps has greater application than the experience some other country might have in the same field.

As I understand it, we have, of course, tremendous experience in many aspects of the use of nuclear energy and one of these aspects is the provision of reactors and our particular kind of reactor, as I understand it, generates a lot of usable heat and usable heat is the thing that is needed for the desalination of water.

For that reason the provision of the basic heat for desalination is something that we can do.

Now, beyond that, the actual technology of the desalination process is, as I understand it from the Atomic Energy Corporation something they really have not done very much in because we have no need in Canada for the desalination of water and it does not make great sense for us to be developing a special capability in an area where we do not have any domestic need.

The Chairman: We are told that our nuclear energy programs may not be too successful as the years go by if we do not export that technology.

Mr. Strong: Frankly from the point of view of the developing countries I would say that because we have limited resources our task is to make the most effective use of those resources as far as the developing countries are concerned.

Now, for us to spend an awful lot of money developing a technology which we do not need for ourselves really, and which the developing countries can get from somebody else, I would question whether that would make good use of our resources.

I would much rather think, for example, in some field where our experience arose out of a domestic need as well as any international need that there would be a greater combined incentive to concentrate in an area of that kind than there would be to concentrate in the other area, but that is just a personal view.

Senator Hays: In this area what about the field of insecticides, for instance; should Canada be doing more work in the field of insecticides, and I cite another example in Kenya, where they burn off their grass to do away with the ticks.

It seems to be these vast areas where we could use insecticides without having to burn them; they burn off enough to feed their nation, I suppose, once or twice a year.

Really what we are trying to find out in this committee is should Canada be spending more in research in certain areas that they are good at that might have some economic impact back at home, and still do a job? Not that you should be doing it, but should we in the scientific policy?

Mr. Strong: We have had to develop certain premises which are not policies at this stage, but for the purpose of taking a rational look at this field we have had to make certain assumptions. Whether or not those assumptions will be translated into policy is not for us to say.

One of those assumptions is that in looking internationally at what we might be doing in the developing countries we should be looking especially at those areas where we either have capabilities now or where we are going to need to develop capabilities domestically. These are the areas in which we should be concentrating internationally.

That does not preclude us from doing something or considering something that might have no application at all at home, but it seemed to us just sensible that a combined incentive of a need that we could see in Canada plus a need in a developing country would permit you to allocate more total resources and therefore make it more likely that the Canadian contribution would have a somewhat unique aspect to it than if you tried to duplicate something that the United States or some other country can do better than you because it simply has a greater need for it and is therefore able to employ more resources.

It seemed to us that with our limited resources we could do those things which we are uniquely capable

of doing well. You might really redefine that and say better than anybody else.

Senator Hays: In that field have you any suggestions, with your experience, that we should be doing more of where we do have this usage and this technology and that sort of thing?

Mr. Strong: I cannot say, because I am not an expert in this; that is one of the reasons for employing all these experts, to do that.

Some of the things that they have come up with are very much in line with what you have been saying.

In the field of transportation there are a number of areas in which our own experience and our own needs give us a special interest.

The field of water resources I have already mentioned; the field of insecticides and pesticides, insect control. Even though the insects are different in the other countries, I gather that the basic science or the technology is similar.

The field of multilingualism and the difficulties of living together in a bilingual bicultural environment.

The Chairman: We may have something to learn from them.

Mr. Strong: Indeed, but let me give a specific example here: I touched on it earlier when I mentioned radiation of food. The food industry in Canada has shown a great deal of enterprise and I think a great deal of statesmanship in its attitude towards the developing countries.

The food industry has sponsored several programs that are designed to bring the secrets of food preservation, food distribution and food technology to developing countries.

Canada has therefore developed something of a special expertise in this area and the fact that the food industry, the companies themselves, have seen fit to support this kind of activity has meant that we are developing some experience in translating our knowledge in this field in Canada into developing country environments.

When it is estimated that something like half the food that is grown in many of these countries is wasted somewhere between the field and the customer, it is obvious that there is a tremendous amount of need for new research and new applications of technology in this field.

I would think because of the fact that we have a willing and cooperative industry, we have the knowledge, we have made a start in this area, we find there is a tremendous need for this kind of thing,

that this could well be one of the areas in which we might proceed.

Senator Hays: Packaging, and that sort of thing?

Mr. Strong: Yes, everything, preserving, packaging, even such things as utilizing local products, putting them into a form in which they are marketable and acceptable and protein enriching of products.

For example, you may have heard that in Hong Kong the largest selling soft drink now is a protein soya bean type of drink. Everyone knew basically how to make a drink like this, as I understand it, but the secret was that some person with the marketing background learned how to package it and put it up and sell it in a way which made it attractive. It now outsells coca-cola and it meets a tremendous problem, the need for more protein and it makes good utilization of a local product.

So there are lots of instances where the technical problems and the marketing problems have got to be looked at together; it is not good enough just to provide a new source of food, you have got to make people want to eat it.

This is an area where, as I say, Canadians have shown a special interest and they certainly have a high degree of experience and we have found a high degree of acceptability to Canadian activity in this field abroad.

Senator Hays: And we have the resources and that sort of thing to make it possible for Canadians to compete with other countries in the world in the merchandising of this sort of product?

Mr. Strong: That is right; mind you, the programs to date have not been programs designed to, while they have been financed by funds raised under the sponsorship largely of the food industry in Canada, they have not necessarily been directed to expanding Canadian markets in these areas. They have been mainly related to expanding the possibilities of utilizing local products.

The Chairman: Are there any other questions?

Senator Haig: What are your relations with CUSO?

Mr. Strong: CUSO is an independent organization, but it receives a very high percentage, a little over 90%, of its actual cash requirements from us under our aid program. We have a very close cooperative relationship with them.

As you know, while the government provides, as I mentioned, a little over 90% of its actual budget, the total contribution of CUSO cannot be measured by the cash resources alone.

Senator Haig: Who decides what country the teachers go to?

Mr. Strong: The CUSO board of directors, since it is an independent board of directors, decides this; we are not represented on the board of directors, but we do consult with them, obviously, very frequently. We would have the right to provide our funds to them on a basis that would require them to use those funds in certain specific countries. We would have no right to interfere with the funds they get from other sources to do whatever they want to do. In fact, the problem has not really arisen; we have been kept fully informed of their various activities and our relationship is a very harmonious one.

Senator Haig: In connection with this trainee program, how are the trainees picked to come here to Canada?

Mr. Strong: I would like Mr. Kidd, our Vice-president, to explain how this program is carried out under the operating branch of our organization, for which Mr. Kidd is responsible.

Mr. G. P. Kidd, Vice-President, The Canadian International Development Agency: Senator, we try to work out with each developing country the number of trainees required in various fields on an annual allocation basis. Then they nominate people who we vet, to ensure that they have the right sort of qualifications. When nominated we arrange to place them in a Canadian educational institution which would seem to meet the training requirements for which they are being put forward. Trainees must, however, be accepted by the institution before they are brought under CIDA sponsorship.

Senator Haig: Do you pay their living cost here?

Mr. Kidd: We pay their transportation here, their tuition fees, and we give them a monthly stipend and several miscellaneous allowances.

Senator Haig: Well, the next time you bring anyone from Saba make sure they get enough rice. I met a couple of chaps over there and one of the complaints they had about living in Ottawa, the cold weather was one, but the second was the lack of rice.

So that is just a tip I hand to you, sir.

Is there any increase in the demand for telecommunications, radio, TV or phones in these developing countries?

Mr. Strong: Yes; radio telephones, did you say, Senator?

Senator Haig: No, radio, television or telephones?

Mr. Strong: I do not have figures on this, but my understanding is quite clearly that there are; in the telephone field we know specifically of significant demands.

In the field of radio and television I assume that there are demands but not as much knowledge.

Senator Haig: Would you explain the difference between a loan and a grant?

Mr. Strong: Yes; the grant is an outright gift; the loan is a loan. The terms of our loans generally are a 50 year term, zero interest and 10 year grace period on repayment.

The Chairman: So-called soft loans.

Mr. Strong: They are very soft loans. I might say, though, that the soft loan program has been increased as the grant part of our allocations has been decreased, so while it might be said that these loans are and they indeed are, very, very soft, they nevertheless do carry with them an expectation and a commitment of payment which is not true of grants.

Senator Haig: Mr. Strong, when your organization decides on an aid program to a developing country, say Uganda or Malaysia, what supervision do you have over that program?

Mr. Strong: There are two kinds of supervision, Senator: Firstly, if it is a project which requires a building or construction of a capital structure of some kind, we would engage a Canadian contractor or a Canadian engineering firm and that firm would be responsible for the actual completion of the project.

In terms of the overall supervision of our program, the administration of the program in the field, which would include the overseeing of a multiplicity of projects that are going on in a given country, this is done on our behalf by the Canadian Mission, under the high commissioner or the ambassador in the country concerned, and for that purpose the Mission reports to our office on matters of aid administration in the country.

Senator Haig: In addition to the science disciplines you have mentioned in appendix A, Table III, are there any other studies being made by the native population in government management, the civil service personnel?

I met several when I was overseas in which they had come to Canada for government management; is that increasing or decreasing?

Mr. Strong: I might ask Mr. Kidd to comment on this in more detail, but we place a great deal of emphasis on this area.

We do bring people from the developing countries to Canada for training in this area. We also have provided experts from Canada in various programs of this kind that are carried out in the developing countries themselves.

Mr. Kidd: I just might add, Mr. Senator, we actually have public administration courses both at the senior and the junior level and both in the English language and the French language.

At the present time the English language one is operated through Carleton University and the French language one through the University of Ottawa.

The Chairman: I would like to ask a question of Mr. Kidd, if I may, as a result of the answer he gave a moment ago:

The students that are coming from developing countries to Canadian universities, they have to pass a series of tests I understand before they come here?

Mr. Kidd: Yes, we must be satisfied that their educational qualifications will be recognized by the university; in fact the university has to accept them before we can place them.

The Chairman: Is it true that these tests that we are using now are American tests developed by the college board in the United States, because to my knowledge there is no such system of tests in Canada?

Mr. Kidd: I think this would depend actually on whether the Canadian university would accept the educational qualifications of institutions in another country.

The Chairman: They use American tests at the moment, I think.

Mr. Strong: I had occasion to look at this at one point; we do not impose these requirements. Our requirement is that they be accepted by the Canadian university for the course for which we have agreed to provide the assistance.

The other requirement is that they be nominated by their government.

The Chairman: Who pays for the test, the student or Canada?

Mr. Strong: I must say I do not know who pays for the test; I have never had occasion to look into that question, Senator. I would certainly be very glad to provide you with an answer.

The Chairman: Finally, so far as I am concerned at least you were saying at the beginning that there were about 60 institutions in the world at the moment devoting their energies at least partly to the research problems of developing countries.

Dr. Peters: That figure is available.

The Chairman: The number of 60 is not too important for me at the moment.

Is there among this group a Canadian institution?

Mr. Strong: No, the 60 that I referred to, Senator, are 60 from developing countries.

Now, there are a great deal more institutions than 60 involved in some fashion or another in research that would relate to developing countries. There is no single institution, however, to my knowledge that is directed specifically and solely at the application of science and technology to developing countries.

The Chairman: There is no specific institution in the world?

Mr. Strong: In the education field UNESCO perhaps; you might call the Development Centre or DAC as close to this as possible, but it operates mainly in the field of economic research.

Dr. Peters: I wonder, Mr. Strong, if an example of what the Senator is referring would be the Delft University at The Hague in connection with its technical training in aerial photography interpretation, which is heralded as being an outstanding institute of this training type with application to the developing nations.

The Chairman: What I am getting at is whether or not there is at the moment in any other country in the world an institution which would correspond more or less to the international centre that you are contemplating?

Mr. Strong: No, really there is nothing like this anywhere in the world. As a matter of fact the thought that led to the suggestions of the creation of this institution arose out of the process of looking at our own situation and arriving at the conclusion that it was pretty obvious that we had to produce something for our own purposes and then try to find out what other people were doing. In the process of trying to find out what other people were doing we discovered that here was, a great gap that really nobody was filling.

Now, that is not to say that a good deal is not being done; a great deal is being done here, there and everywhere.

The Chairman: But without any kind of global approach.

Mr. Strong: That is right. Now, in certain fields there are specialized institutions; I know we mentioned the rice institute, which was recently created for the purpose of increasing rice production.

The Chairman: In spite of Senator Haig's remark you will not go for research in rice in this agency?

Senator Haig: That is an Ottawa problem, Mr. Chairman.

Mr. Strong: I would think we would have a great deal of interest in what is going on; a good deal of expertise is in fact involved in this rice program, not because we have expertise in rice per se, but because we have expertise in the various sciences that are required in the improvement and production of rice.

I might also mention there are specialized institutions like the Tropical Products Institute in the United Kingdom, which arose out of their colonial experience and which now does a good deal of work in the field of tropical products.

I would say probably the Rockefeller and Ford Foundations more than almost any other organizations certainly that I am acquainted with have focused their attention and a good deal of their resources on this particular problem.

The Chairman: But how is it that OECD or the United Nations have not been more interested in that field?

Mr. Strong: I would suggest, Senator, it is not so much a lack of interest.

The Chairman: Apparently they have not done very much.

Mr. Strong: One of the problems that is encountered internationally is the problem which we have domestically, with which you will be much more familiar than I am, that is that the institutional structures within the international community, like the ones domestically, have not necessarily been based on a multi-disciplinary approach to problem solving.

They have tended to look at agriculture, they have tended to look at energy, mines, etc. and the institutions are set up in a rather segmented way which has meant that it has been very difficult for people to agree on what is the central institution that should be looking at the whole problem.

It is also a matter of resources; there have been a lot of people working hard on this problem and a lot of people that are extremely interested in it, but they just have not yet, as we have not domestically, devised

the right kind of institutions that could cut through all the existing established, what you might call vested interests in the field, and start to look at the totality of the problem and have nay particular jurisdiction over allocation of resources.

The Chairman: I am told this project has been welcomed by many countries which have promised their support and their cooperation; is that true?

Mr. Strong: As a matter of fact, Senator, I think one of the things that has led to our own interest in this matter is the realization that while we were looking into the problem for ourselves other people were very anxious to see us take some sort of lead.

We have been encouraged from all directions, the World Bank, the United Nations Development Program; Mr. McNamara at the World Bank particularly has taken an interest in this.

I have to say that in the process of consulting on this around the world we have found a great deal of enthusiasm for this idea and I do think that at this point it looks like a Canadian lead in this area would be welcomed by everybody, certainly everybody we have talked to in the international community.

The Chairman: Would the delay in announcing this project, not in announcing, but coming to a final government decision in regard to it, be explained partly by what Mr. Pearson is doing in terms of his study for the World Bank?

Mr. Strong: No, I think the setting up of a new institution of this kind has to be submitted to and approved by Parliament.

The government has indicated its intention to do this, which suggests that the next step in the procedure will be to lay legislation before Parliament.

This is not up to us to determine, as to when this is done or as to in what form it might be done. However, I can say that it is within our existing terms of reference and within our existing authorities to continue to pursue the studies and the inquiries that we have been making in the last two years.

We do not have the power to set up a new institution, but within our existing mandate there is a great deal of work that we can do and that we are doing in this field.

There will come a point, of course, where any decision to delay the creation or non-creation of the special institution that is proposed would work to our disadvantage; I cannot say at this point that we have reached the point where we are feeling too limited.

Dr. L. A. E. Doe, Special Advisor, The Canadian International Development Agency: Mr. Chairman, I have a comment that bears more on the earlier part of the discussion than on the latter part. I sensed that there was a little ambiguity in the use of the term research as it has been used this morning and possibly some confusion.

The Chairman: We always speak in this committee of research and development.

Dr. Doe: Yes; let us set aside for the moment research on natural science and technology, the development of atomic energy and so on.

In the social economic field we have used the term research where I think we might have been a little clearer if we had used the term analysis. A new program is undertaken, let us say, in the field; one of the major functions undertaken at the present time is an evaluation of the total situation in which that is going to take place.

We have referred to that; Mr. Strong especially referred to this operations research and so forth. I think if he had used the term analysis of the situation it might have been a little less confusing, because basically what is involved here is the use of essentially accepted procedures and criteria, systems of values, if you like,

in order to make decisions that have to be made in order to get on with the job.

The Chairman: It is an evaluation.

Dr. Doe: It is an evaluation, right. The new International Development Centre that has been discussed more recently will be concerned presumably with research in a slightly more isolated sense. It is research in the sense of let us go back and evaluate the criteria, let us look at the systems of analysis that we are using, what are the fundamental values that are involved in making these decisions?

Now, there is a broad grey area that lies between the two, but I think the distinction may have been a little bit confused in your discussion.

The Chairman: Thank you. On behalf of the members of the committee I want to thank you very much. I am quite certain though that once the government has reached its decision about this research centre and brings legislation before Parliament that you will be back with us, because we will certainly want to have a close look and a very interested look into your proposals.

The committee adjourned.

APPENDIX 33

THE SENATE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

B R I E F

Prepared by

THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

FEBRUARY, 1969

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Science Policy Research Unit, University of
Sussex, Brighton, England

PRESENTATION

As the body responsible for administering Canada's international development assistance program, the Canadian International Development Agency is concerned with Canadian Science Policy in two principal respects:

- 1) The availability of Canadian resources in the field of science and technology for use in our assistance programs;
 - 2) The optimum utilization of these resources both from the point of view of the developed nations and of Canada.
2. Background information concerning the organization of our Agency and its programs is annexed as appendix A to this presentation.
3. As indicated in appendix A, this Agency has made extensive and growing use of Canadian scientific and technological resources in its programs. A substantial proportion (or approximately 23%) of the personnel who have been sent to developing countries under our bilateral programs since its commencement have been people qualified in one of the sciences or technical vocations. They serve as teachers and advisors in a great variety of ways, all of which are designed to help the people of the countries in which they serve to develop their own skills and capabilities. The very term "technical assistance" which is used to describe programs of this type implies application and transference of technical skills and knowhow.

4. Another form of assistance we provide under our bilateral program is education and training in Canada of personnel from the less developed countries. Of the total of 7,800 persons that have been brought to Canada under this program since its commencement approximately 52% received education or training in one of the sciences or in a field which we regarded as technical. Thus the capacities of Canadian universities and other institutions where training is available have been used for this purpose. To an increasing extent many of these institutions are also becoming directly involved in the planning and implementation of projects which involve both sending of personnel overseas and training of counterpart personnel from the cooperating country in Canada.

5. Capital Assistance has been another major element in the Canadian program which involves the use of Canadian scientific and technical personnel and capabilities. Since the inception of our program to the end of fiscal year 1967-68, we have spent some \$282.3 million on projects of a capital nature - dams, hydro-electric power plants, irrigation projects, atomic energy plants, schools, universities, and other installations. We have also conducted resource studies, aerial surveys, transportation studies and many other engineering and technical surveys. All of these projects are carried out on a contract basis by Canadian organizations, both business and governmental. They invariably require the use of Canadian technical personnel and of course are based on utilization of Canadian scientific and technological capabilities. The substantial number of personnel employed directly overseas by these contractors are not included in the figures referred to above.

6. All of the foregoing relates to our bilateral programs. In addition Canada has contributed a total of approximately \$359 million to multilateral agencies engaged in the development field since 1951. Many of these agencies also draw on Canadian scientific and technological personnel and Canadian institutional capabilities in the planning and implementation of their programs.

7. The Canadian government has indicated that it intends to continue to increase its allocations for international development assistance to the point where they will reach the internationally accepted target of 1% of gross national income by the early 1970's. This means that there will be a corresponding increase in the extent to which we will be drawing on the resources of Canadian science and technology in the foreseeable future. In fact, for reasons which I will elaborate later in this presentation it is likely that our use of Canadian scientific and technological capabilities will increase at a somewhat greater rate than the growth of our expenditures.

8. In the past, we have used these resources in response to individual requests for assistance. The overall program as reflected in the figures referred to in appendix A simply represents the sum total of the vast number of individual projects resulting from this process of request and response. While each individual project is based on matching a particular Canadian capability to a specific need in the developing country concerned there has been no framework within which we have been able to plan our programs to ensure that the most effective use is made of these resources.

9. This is one of the reasons why the work of this Committee is of such importance to us. Our planning requires the best possible knowledge of Canadian science priorities. It is important that we know present and projected future Canadian capabilities in the fields applicable to the needs of the developing countries and the extent to which these capabilities may be available to us. It is equally important for those involved in Canadian science and policy and planning to take into account the extent to which our programs are going to be drawing on these capabilities. As our programs will be growing at a significant rate and are likely to be a continuing feature of our national life for the foreseeable future, I believe that they must be taken fully into account in establishing our national science policies and priorities. This requires much closer cooperation between our Agency and the Canadian science community.

10. I referred to the use made in our program of Canadian scientific and technological resources. I would like to point out that this by no means represents a net drain on those resources. It equally represents a vitally important extension of Canadian experience into the international field which can bring significant benefits to Canada. In another sense our expenditures in this field represent an addition to the total expenditures being made for the advancement of Canadian science and technology even though, of course, their principal purpose is to assist the developing countries.

11. Let me now make some more general comments about the role of science and technology in meeting the problems of the developing countries and the special opportunities available to Canada in this field.

12. The majority of people in the Western world today enjoy material conditions of life that are unparalleled in the annals of human experience. Moreover, the prospects are for continuing progress towards significantly higher levels of affluence. To a large extent this has been made possible by the development of science and technology and its application to the processes of industrialization.

13. If the changes which have taken place in response to advances in science and technology have on balance been beneficial it is not because they were designed that way. Generally, economic and social change has occurred as a by-product of scientific and technological change. And while the immediate benefits of the technological revolution are apparent to all, it is becoming ever more evident that it has created some massive and growing imbalances which threaten in time to negate all the progress that has been made. Within our own societies there are imbalances in the degree to which various groups and individuals share in the benefits of this progress. There are the imbalances in our ecological environment resulting from the pollution of water and air and the vast concentrations of population in a relatively few urban areas.

14. But the greatest imbalance with which we must deal is the vast disparity which exists today between the privileged minority who live in the industrialized nations and the unprivileged majority who live in the less developed nations of the world. On the one hand we have been able to multiply our own economic growth so that the income of the average Canadian increases each year by an amount equal to the total annual income of the average person in the less developed countries. On the other hand we have introduced to these countries measures for the improvement of health which have reduced their death rates drastically and produced dramatic increases in population which are offsetting their efforts to bring a better life to their peoples. We may simply have saved them from one fate only to subject them to another.

15. There is an urgent need for us to relate our utilization of the fruits of science and technology more directly to their economic and social consequences. Today, with the systems' approach to the identification of problems and the search for solutions, it has become feasible to use consciously our scientific and technological resources to induce and accelerate economic and social change. The very science and technology which has helped to create the imbalances which threaten our society can be and must be invoked to bring a better life to the many as it has already done for the few.

16. Much of the basic technology of our age has been developed under the stimulus of the two World Wars and since then of the space race and the nuclear arms race. The rewards inherent in the market economy have provided

powerful commercial incentives for the adaptations of this technology to the development of new consumer products. There is no similar immediate incentive for the application of this technology to the economic and social problems of the developing countries. This gap can be filled through assistance programs which are especially designed to provide the impetus required to bring these resources to bear on fundamental development needs. Only in this way can the necessary multipliers be introduced into the development process.

17. But there is no easy or automatic way in which the benefits of science and technology can be quickly transferred to the developing nations. We must do more than simply transfer to them part of the wealth which we have been able to produce through our mastery of science and technology. We must help them to develop their own capabilities so that they may adapt and apply to the resolution of their own development problems, the new knowledge and techniques which can be made available to them out of our experience. But in doing this some difficult problems must be faced - inadequate educational systems, cultural and social traditions which are often alien to the scientific method and a dearth of the kind and quality of institutions required to nurture scientific and technological development. It will require a good deal of new thinking and research and the allocation of much greater resources if this problem is to be faced and the developing countries helped to acquire the capabilities in the field of science and technology that they require to deal successfully with their development problems.

18. Successful industries in North America allocate some five to six per cent of their total annual sales to research and development. Although economic and social development of the less developed countries is, if anything, more complex than industrial development, there has been no similar emphasis in international development aid programs. In fact the best estimates available indicate that less than $\frac{1}{2}$ to 1% of overall aid expenditures have been for research related to the effectiveness of the development process.

19. For the past two years, our Agency has been engaged in detailed investigations on the role of research, science and technology in meeting the development needs of the less developed countries and of the ways in which the nature, quality and direction of Canada's external aid program might be improved by placing greater emphasis in the field of research and the application of science and technology to the development process.

20. Our investigations have shown that there are substantial gaps in the efforts now being made in the international community to meet this problem. It is now widely recognized that far too few resources have been deployed in concerted attempts to bring the resources of science and technology to bear directly on the fundamental problems of underdevelopment.

21. The instances in which this has been done have provided some dramatic examples of what can be achieved. Perhaps the best examples are the programs pioneered by the Ford and Rockefeller Foundations for the development of new high yielding varieties of wheat and rice and their

introduction into the countries of South East Asia. As a result the entire outlook for food production in South East Asia has been dramatically altered. The production of wheat and rice has already increased substantially and it is now fully within the range of practicality to foresee that India and Pakistan may achieve self-sufficiency in food grains within the next decade, a feat which would have seemed virtually impossible three or four years ago.

22. In education, the development of electronic devices and satellite communications now brings it within the range of the possibility to make basic education available to the vast numbers of people in the developing countries more rapidly than could be done by traditional methods and, at least potentially, at lower unit cost. Nuclear power holds out the possibility of making the deserts bloom through the establishment of massive agro-industrial complexes based on desalination of water and the production of low cost fertilizers. Even modern marketing and public relations techniques offer great potential for helping to cope with what are perhaps the most stubborn of all barriers to development - the deeply ingrained attitudes, habits and prejudices of people. In almost every field there is available, either actually or potentially, basic scientific and technological capacity which can be brought to bear directly on the fundamental problems of under-development.

23. Our investigations indicated that key people in this field, both in Canada and internationally, consider that Canada can play an important part in this process through its international development assistance program. A number of reasons are given for this. Amongst the points stressed are:

-Canada is in the midst of a rural-urban-industrial transition and therefore Canadians are fast gaining experience in the problems of "development" in the face of great distances, diverse regions, intractable resources, etc.;

-Many of the fields in which Canadians are particularly experienced through the development of their own natural resources, i.e., water, power, minerals, agriculture, forests and fisheries are especially relevant to the priority needs of the less developed nations;

-Canadians also have experience in the development of political independence;

-Canadians are not suspect either because they have been empire-builders or colonial exploiters in the past or because of great-power ambitions in the present and future;

-Canadians are, nevertheless, fully abreast of the most up-to-date developments in world science and technology and in a specially good position to apply and adapt this knowledge to the needs of developing countries;

-Canadians' experience of bilingualism, bi-culturalism, multiracialism and federalism can give them an insight into the problems of many other developing countries.

24. In carrying out the investigations I have referred to, we had the benefit of the services of a number of experts from Canada and abroad. These experts identified a substantial number of specific areas in which Canadian capabilities

were particularly relevant to the needs of developing country's needs. They provide the basis for the addition of an important new dimension to our international development assistance program.

25. Copies of two of the papers prepared for us in the course of the investigations to which I have referred are annexed as appendices B and C respectively to this presentation. As both of these papers deal with the more general aspects of this matter from two particularly interesting perspectives, I thought they might be of interest to the Committee. They are included with the approval of the authors. Appendix B is a report by Professor Irving Brecher, Director of the Centre for Developing Area Studies at McGill University and Appendix C is a report by Dr. C. H. G. Oldham of the Science Policy Research Unit, University of Sussex, Brighton, England.

26. In the speech from the Throne on Thursday, September the 12th the government indicated its intention to bring before Parliament, legislation establishing an International Development Centre. Such a Centre could provide a significant new instrumentality through which many of the opportunities revealed in our investigations could be met. We hope that in establishing priorities and making plans for the future of Canadian science, full recognition will be given to the greatly increased role it will be expected to play in meeting the basic needs of the less developed nations of the world.

APPENDIX "A"

CANADIAN INTERNATIONAL DEVELOPMENT AGENCYORGANIZATION AND ADMINISTRATIONORGANIZATION AND MANAGEMENT OF INTERNATIONAL ASSISTANCE PROGRAMS

The management of international assistance programs at the official level is conducted by:

- (a) the Canadian International Development Agency (CIDA) which has overall responsibility for the management and operation of these programs;
- (b) the Canadian International Development Board which advises the Secretary of State for External Affairs on major policy issues related to international Development and constitutes the formal machinery for interdepartmental consultation on international development assistance policy in general; and
- (c) Canadian Missions abroad which carry out, on behalf of the Agency, field administration of development assistance activities.

2. By Order of the Governor General in Council, dated September 12, 1968, the titles "External Aid Office" and "External Aid Board" were changed to "Canadian International Development Agency" and "Canadian International Development Board" respectively to better reflect the true nature and purpose of Canada's international assistance programs.

3. The External Aid Office, predecessor of CIDA, was created as a consequence of a Government decision made on August 24, 1960, to place under one Minister (Secretary of State for External Affairs) responsibility for supervision and control of aid programs which previously had been shared by the Departments of External Affairs, Trade and Commerce, and Finance.

4. The Canadian International Development Agency is administered by a President reporting to the Minister and acting in consultation with the Canadian International Development Board. The main responsibilities for the President are summarized as follows:

- (a) the operation and administration of Canada's economic assistance programs;
- (b) to ensure co-ordination in operations of other Departments concerned with various aspects of these programs;
- (c) to consult and co-operate as appropriate with international organizations and agencies, and with Canadian voluntary agencies active in under-developed countries;
- (d) to co-ordinate Canadian efforts to provide emergency assistance; and
- (e) to administer the Canadian International Development Agency.

5. The Canadian International Development Board was established as a result of the same Cabinet decision as the one which created the External Aid Office and replaced the former Interdepartmental Committee on External Aid Policy. The Board's membership consists of the President of CIDA (designated as Chairman), the Deputy Ministers of the Departments of Finance, Trade and Commerce, External Affairs, and the Governor of the Bank of Canada. Representatives from other departments and agencies with a direct interest in economic assistance attend as appropriate.

The Board advises the Secretary of State for External Affairs through the President of CIDA on all major policy matters. More detailed interdepartmental consultation is carried out through a committee which is composed of representatives from the same departments as those represented on the Board itself and from other departments with a significant interest in particular matters which are being considered.

6. The Canadian Missions abroad from the inception of Canada's development assistance programmes have been responsible for the field administration of development assistance in the recipient countries, and in respect to their development assistance responsibilities report directly to the Canadian International Development Agency. The principal functions of the missions in development administration include:

- (a) compilation of information on economies and development plans of the countries to which they are accredited;
- (b) receipt of and advice to CIDA on project requests;
- (c) liaison with local authorities;
- (d) assistance and advice on project implementation and evaluation.

STATUS OF CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

7. The Canadian International Development Agency has been designated as a department for purposes of the Public Service Employment Act, the Public Service Staff Relations Act and the Financial Administration Act.

RE-ORGANIZATION OF THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

8. To ensure that CIDA had an appropriate organization designed to meet the increasing demands arising from expansion and changes in programs, the Public Service Commission, in February, 1967, was invited to conduct a complete study of the Agency organization. The study report was received in June, reviewed by Agency management early in July, and approved in principle by the Treasury Board at its meeting of September 28, 1967. The Agency commenced operations within the framework of the new organization on October 1, 1967.

9. The significant changes embodied in the new organization, which are reflected in the Organization Chart - Annex 1, are:

- (a) a clear distribution of responsibilities among three main branches, namely,
 - (i) Planning and Economics
 - (ii) Operations
 - (iii) Support Services
- (b) the creation of a new and separate Personnel Division;
- (c) attachment of a small staff group to the President;
- (d) provision for Special Advisers in those fields in which CIDA undertakes significant programs; e.g., Agriculture, Forestry, Transportation, Education, Social Welfare, Fisheries and Energy;
- (e) creation of a Multilateral Aid Division, Voluntary Agencies Division, and a Business and Industry Division;
- (f) provision for improved co-ordination in project development implementation; and
- (g) provision for internal management services.

PERSONNEL

10. The approved strength level has grown from 300 positions in 1966-67 to 456 in the current year. While primarily due to expansion in the program itself, this increase also takes into account the broadening scope of CIDA's responsibilities and the recognized need for a more professional approach to aid administration.

11. Present strength consists of 405 staff members and 10 officers seconded from other departments, mainly from the Department of External Affairs. In addition, there are 16 persons currently employed on a contract basis to do special studies.

ORGANIZATIONAL FUNCTIONS RELATED TO SCIENTIFIC ACTIVITIES

12. The Agency has no statutory function or specific powers in respect of scientific activities. However, in providing assistance to developing countries, a distinct contribution is made to scientific activities both in Canada and in these countries. The contribution is reflected in a stream of activities representing capital and technical assistance extended to French and English-speaking countries of South and South-East Asia (Colombo Plan)), to Commonwealth African countries (Special Commonwealth Africa Assistance Plan (SCAAP)), to Independent French-speaking African States (IFAS)), to the Commonwealth countries of the Caribbean (Commonwealth Caribbean Assistance Plan (CCAP)) and to Latin America through the Inter-American Development Bank. Much of the technical aid directly involves Canadian universities, technical institutes, and other post-secondary institutions and may be considered in terms of two broad categories.

The first involves the sending of advisers and teachers to developing countries; the second, the bringing of trainees from these countries to Canada for the purpose of providing training unavailable or difficult to obtain in their home countries. Capital assistance which, in terms of dollars, represents the largest proportion of Canadian aid to developing countries and constitutes approximately 85% of the total allocations, involves the supplying of industrial and basic commodities from Canada and other types of goods in the form of equipment and building materials. In some cases the supplying of such goods can be related to the support of scientific activities and to the extent that it has been possible to determine this relationship, such expenditures have been included in the statistics presented under Capital Assistance.

PERSONNEL POLICIES

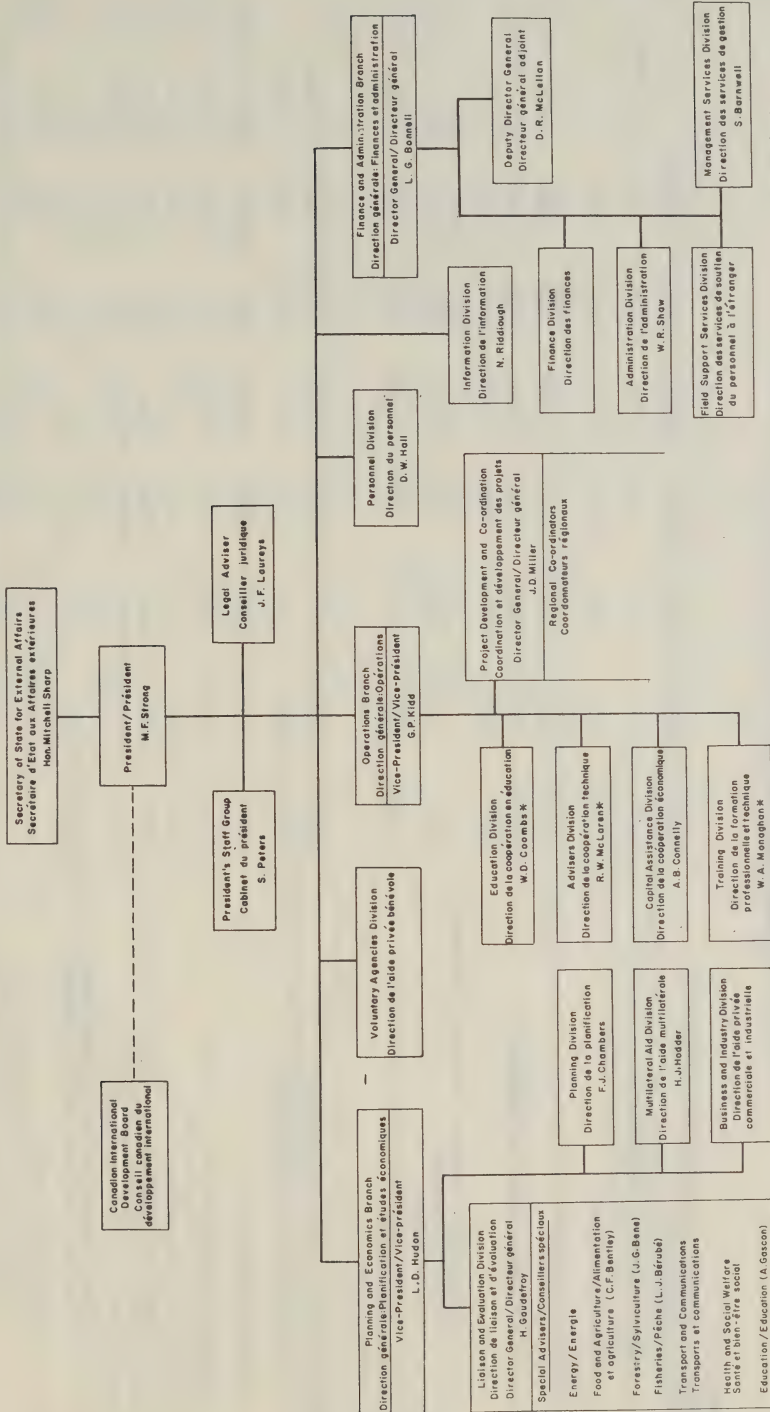
13. The development assistance activities are provided within a framework which is both co-operative and responsive in nature in that the recipient country establishes its development priorities and, after discussion with Canada concerning sectors in which Canadian resources can be effectively utilized to promote economic development, requests Canada's assistance in the implementation of specific projects. It is increasingly evident that scientific research will play an important part in the carrying out of international development programs. It is in assisting the developing countries to achieve their goals in respect of scientific activities and aspirations in the fields of science that the Canadian International Development Agency would give emphasis to the recruitment, secondment or placing under contract scientific personnel for the purpose of carrying out Canada's commitment in assistance to the countries concerned. There are no individuals on the immediate strength of the Agency who might be deemed to be specifically engaged in scientific activities. As indicated above, the support for scientific activities in terms of people is provided through the technical assistance program involving teachers, advisers, trainees and persons under contract.

... 7

EXPENDITURES AND MANPOWER RELATED TO SCIENTIFIC ACTIVITIES

14. Funds and numbers of personnel estimated to have been deployed under CIDA programs for the fiscal years 1962/63 to 1968/69 inclusive on scientific activities, are set out in Tables I and IV attached. In view of the responsive nature and changing character of Canada's international development assistance program, no attempt has been made to forecast expenditures on scientific activities as it is believed that such projections may well be misleading.

CANADIAN INTERNATIONAL DEVELOPMENT AGENCY
AGENCE CANADIENNE DE DÉVELOPPEMENT INTERNATIONAL



APPENDIX "A" TABLE I

TECHNICAL ASSISTANCE - TEACHERS, TEACHER TRAINERS AND PROFESSORS
(Fiscal years 1962/63 to 1968/69 inclusive)

Number of Teachers, Teacher Trainers and Professors by Field of Science	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69*
Engineering and technology	8	10	15	35	26	33	43
Natural sciences	70	97	131	193	258	234	241
Social sciences	7	18	15	39	60	50	54
Total - field of Science	85	125	161	267	344	317	338
Total all Teachers, Teacher Trainers and Professors	152	241	388	665	850	948	952
Percentage scientific activity	56%	52%	41%	40%	40%	33%	25%
Expenditures by Field of Science (\$000's)	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69* Total
Engineering and technology	64	80	135	350	260	363	1,682
Natural sciences	560	776	1,179	1,930	2,580	2,574	12,009
Social sciences	56	144	135	390	600	550	2,415
Total Expenditures - field of science	680	1,000	1,449	2,670	3,440	3,487	16,106
Total Expenditures all Teachers, Teacher Trainers and Professors	1,323	2,039	3,570	6,652	9,110	10,765	43,212
Percentage scientific activity expenditures to total Teachers, Teacher Trainers and Professors Expenditures	51%	49%	42%	40%	37%	32%	37%

* Estimated

APPENDIX "A" TABLE II

TECHNICAL ASSISTANCE - ADVISERS
(Fiscal years 1962/63 to 1968/69 inclusive)

Advisers (in man-years) Note 1	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69*	Total
	13.4	26.0	30.0	33.0	30.0	39.6	42.4	214.4
<u>Estimated Scientific Activity Expenditures By Function (\$000's)</u>								
Research and Development (Intramural)	82	110	260	370	525	592	517	2,456
Research and Development (Industry)	26	-	-	30	20	53	-	129
Data Collection	56	100	196	210	202	260	389	1,413
Scientific Information	-	-	-	-	38	40	13	91
Testing and Standardization	-	-	-	30	30	65	-	125
Education in Engineering & Science	57	30	95	80	10	-	39	311
Total by function	221	240	551	720	825	1,010	958	4,525
<u>Estimated Scientific Activity Expenditures By Application (\$000's)</u>								
Nuclear Energy	-	100	365	400	500	662	665	2,784
Agricultural (including fisheries and forestry)	-	-	-	-	-	20	-	20
Transportation	16	-	-	-	-	35	-	51
Telecommunications	25	-	-	20	20	39	13	117
Industry	88	140	186	300	300	254	280	1,548
Underdeveloped Areas	-	-	-	-	-	-	-	-
Total by application	221	240	551	720	825	1,010	958	4,525
Total Expenditures - All Advisers (\$000's)	840	998	1,624	2,394	3,686	3,761	3,019	16,322
Percentage scientific expenditures to total adviser expenditures	26%	24%	34%	30%	22%	26%	31%	28%

* Estimated

Note 1. Data one not available on the scientific disciplines involved since programs are handled on a project basis with many projects having a multi-disciplinary mix.

TECHNICAL ASSISTANCE - TRAINEES*
(Fiscal Years 1962-63 to 1968-69 Inclusive)

Number of Trainees in Canada by Scientific Discipline		1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Engineering and Technology		100	120	194	532	602	591	628
Natural Sciences		210	256	310	458	604	630	725
Social Sciences		89	111	241	263	304	269	282
Total		<u>399</u>	<u>487</u>	<u>745</u>	<u>1,253</u>	<u>1,510</u>	<u>1,490</u>	<u>1,635</u>
Total trainees		<u>770</u>	<u>1,121</u>	<u>1,499</u>	<u>2,053</u>	<u>2,633</u>	<u>3,071</u>	<u>2,826</u>
% to total trainees		<u>51%</u>	<u>43%</u>	<u>50%</u>	<u>61%</u>	<u>57%</u>	<u>48%</u>	<u>57%</u>

Expenditure by Scientific Discipline (\$000's)		1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	Total
Engineering and Technology		230	342	492	1,449	1,929	2,349	1,773	8,564
Natural Sciences		483	720	776	1,242	1,928	2,466	2,053	9,668
Social Sciences		204	316	624	759	1,087	1,058	841	4,889
Total		<u>917</u>	<u>1,378</u>	<u>1,892</u>	<u>3,450</u>	<u>4,944</u>	<u>5,873</u>	<u>4,667</u>	<u>23,121</u>
Total expenditures - all trainees		<u>1,911</u>	<u>2,939</u>	<u>3,785</u>	<u>5,308</u>	<u>7,063</u>	<u>8,396</u>	<u>7,180</u>	<u>36,582</u>
% scientific activity expenditures to total expenditures		<u>47%</u>	<u>46%</u>	<u>50%</u>	<u>65%</u>	<u>69%</u>	<u>70%</u>	<u>65%</u>	<u>63%</u>

* Persons brought to Canada to receive education or training
** Estimated

APPENDIX "A"TABLE IV

CAPITAL ASSISTANCE
Estimate of capital funds expended relating to
scientific development
(\$000's)

<u>Category to which support given</u>	<u>Fiscal years 1962-63 to 1967-68</u>	<u>Fiscal year * 1968-69</u>	<u>Total</u>
Data Collection	16,654	1,487	18,141
Research & Development	610	559	1,169
Scientific Information	16	30	46
Education	<u>4,043</u>	<u>1,583</u>	<u>5,626</u>
Total expenditures related to scientific activity	<u>21,323</u>	<u>3,659</u>	<u>24,982</u>
Total expenditures for capital assistance	<u>128,933</u>	<u>30,288</u>	<u>159,221</u>
Percentage scientific activity expenditures to total capital assistance expenditures	<u>16.5%</u>	<u>12.1%</u>	<u>15.7%</u>

* Estimated

APPENDIX B

Proposed Program of Social-Science Research

A Working Paper

by

Irving Brecher

Director, Centre for Developing-Area Studies

McGill University

July 26, 1968.

PROPOSED SOCIAL-SCIENCE RESEARCH

"Problems of economic underdevelopment, development, and planning for development ... cannot be studied in isolation but only in their demographic, social, and political setting."*

The direct task at hand is to suggest the most fruitful avenues of socio-economic and political research to be followed by the Canadian programme of assistance to developing countries. However, it is well to pause at the outset and explain the rationale underlying the proposed focus of research effort in this field.

THE BASIC RATIONALEThe Transfer of Technology

There is great merit, of course, in providing a "conceptual umbrella" for the entire range of topics to come under investigation. Given the excitement of the "development" challenge, it would be all too easy to stray from the main road and thereby seriously blunt the cutting edge of a Canadian research programme. In this

* Gunnar Myrdal, Asian Drama: An Inquiry into the Poverty of Nations, 3 vols. (New York: The Twentieth Century Fund, 1968), Vol. I, pp. ix & 42.

context, a double purpose is served by the theme, "applying science and technology in the industrialized countries to accelerate growth in the developing countries:" it is aimed at a crucial need in the poor two-thirds of the world; and it specifies a role which Canada, in terms of its own development, is highly qualified to play.

Having gone this far, however, it is necessary to emphasize that the "transfer of technology" is itself a complex and many-sided process. To be sure, a cheap paper-making machine geared to local raw materials, a new strain of wheat resistant to the extremes of tropical climate, a labour-saving device for refining mineral ores, storage and refrigeration equipment especially suited to frequent handling of food cargo during long-distance transport -- all such technical innovations, involving both design and application, make up a vital part of the "transfer" process. But this does not tell the full story. And to be exclusively preoccupied with these matters is to ignore the equally-vital problems of speeding up the transfer, gauging its impact on the less-developed country or region, and ensuring that it takes root in a healthy institutional and cultural setting.

The transfer mechanism must, in fact, be approached on at least five levels: understanding the socio-economic-political structures of the receiving countries; identifying their major barriers to change and key paths along which change occurs; strengthening the poor countries' overall capacity for "self-help," that is, for generating and sustaining their own forward momentum; "transplanting" the most productivity-oriented scientific and educational techniques of the industrialized countries; and engaging in a continuing review of experience with actual transfers so as to achieve maximum effectiveness

This is not to say that no transfer of technical know-how should be contemplated without an accompanying programme of social-science analysis. A Canadian programme could hardly be expected to proceed simultaneously, and in equal depth, on all fronts. In any event, many instances are bound to arise in which the vigorous application of an adapted technique -- and nothing more -- would probably bring rapid and substantial results. What remains true, however, is that the growth puzzle of the "tiers monde" cannot be unravelled without an understanding of basic social, economic and political forces promoting and impeding change in those countries;

and that "transfer of technology" must therefore be given operational content which goes well beyond the physical and biological sciences.

As already implied, there are obvious dangers in such a flexible approach. It can lead to diffuse, unfocused effort; and it requires special care to maintain that substantial uniqueness without which a Canadian programme could not be readily justified. In fact, a vast array of organizations -- international agencies, government and private institutes, university programmes -- presently occupies the field of social-science research on development problems. From them has come a formidable stream of literature that severely taxes even the most intelligent reader's powers of coordination and understanding. Admittedly, the problems are very complicated; and the search for fundamental solutions will necessarily involve intensive, sometimes-overlapping study covering a broad range of issues. No solid research institution can entirely escape this responsibility. But by the same token, no new research venture can stake a claim in this field unless it carves out its own niche by demonstrating a considerable capacity for doing new things, or doing old things better than they have been done before.

Canadian Capacity

The idea of "Canadian capacity" merits some elaboration here, since, properly defined, it unlocks most of the doors that bar clear-cut decisions on research emphasis for the proposed Centre. A basic ingredient is, of course, the special skills rooted in Canada's own experience and therefore set apart from the talents developed elsewhere. This is the most straightforward expression of "comparative advantage;" and it provides a very solid case for research effort spanning such diverse fields as mining technology, communications, urban growth and culture-language relations.

But comparative advantage has other dimensions, particularly in the Canadian context. For one thing, it applies not only to the development of new skills and new knowledge, but -- no less importantly -- to the adaptation and extension of Western scientific advances to Canadian needs. In substantial measure, this country has grown rich through a process of adaptive innovation built on the inflow of capital and technical know-how from abroad. There is every reason to presume that Canadian ingenuity can bring this innovative process to bear heavily on the problems of the underdeveloped world, often with positive "feedback" effects on Canada itself.

Secondly, it is essential to distinguish between "actual" and "potential" comparative advantage. Canadian research involvement is most clearly indicated in those fields where strong skills and expertise are already in being -- whether in government or the private sector, or both. However, to ignore areas of potential strength is to take an unduly-static view of capacity, to deprive the poor countries of real opportunities for solving major problems, and to damp down Canada's own economic and social development. It goes without saying that concern with potential "growth points" cannot be an open-ended matter; not even the most affluent nation should waste resources in indiscriminating support of research activity. The better part of Canadian wisdom is to encourage incipient research on international development only where the evidence shows both a keen interest in the particular field and an appreciable commitment of human resources to its growth. But once given such evidence, it is just as important for Canada to be generous and imaginative in providing the necessary research support; for this may well be the cheapest and most productive of all possible Canadian contributions to world progress.

"Capacity" has still another, more general, dimension for Canada. It has become commonplace to cite this country's favourable image in the world at large and particularly in its under-developed regions. One can fairly question whether the image is fully deserved and whether it remains untarnished in the face of recurring international crises in recent years. For our purposes, it is a sufficient answer to point out that in terms of seeking economic development in the poor countries, Canadian foreign aid takes second place to no other bilateral programme; that Canada's aid programme is one of the very few to have undergone rapid and sustained expansion during the 1960's; and that Canadian "aid" prestige is now probably at an all-time peak in the councils of international organizations and of national governments in the less-developed world. This gives Canada an enormous comparative advantage in pressing forward with its own search for viable solutions to problems of international development; and, equally significant, in helping to focus the industrialized countries' vast scientific and technical knowledge on these special problems of the "tiers monde." From this perspective, it matters little that Canadian aid has yet to reach the United Nations target of one per cent of national income; or that Canada's international

prestige is more a function of its modest size and influence than of any intrinsic quality of "Canadianism." The crucial point is that, in the light of such prestige, this country now enjoys a dramatically-unique opportunity to combine Canadian and other Western skills in an intensive attack on the social-science problems of international development.

The Compelling Problems

There are, obviously, limits to the scope for effective Canada-sponsored research, even in this major field. It is not merely a question of financial constraints; these are always real, and they always require a clear showing of expected "payoff" before proposed research gets under way. Scarce human resources are likely to pose far more serious difficulties -- especially within Canada, to be sure, but also in the wider international market for research skills. This being so, there can be no refuting the proposition that only the most compelling development problems should be selected for study by the new Centre.

It is no easy task to identify the prime areas of concern in social-science terms. Much "research water" has flowed under

the bridge, and one can hardly see the forest for the trees. Nonetheless, it is not impossible to strip away the excess verbiage and produce a meaningful set of socio-economic prerequisites to accelerated growth in the poor countries. Certain to be at the top of any such list are the following:

- (1) broad, steady and rapid development of agriculture;
- (2) labour, managerial and technical skills adequate to sustain continuing industrialization;
- (3) effective control of population growth;
- (4) success in coping with the most urgent problems of urbanization and unemployment;
- (5) high-level productive efficiency -- with special regard for rapidly-rising exports to, and heavy capital flows from, the developed countries;
- (6) close regional integration along the most profitable lines of trade and investment; and
- (7) solid institutional growth designed to increase the mobilization of domestic resources and to broaden local participation in the development process.

For many of the under-developed nations, poor performance on all

these fronts provides a stark measure of stunted growth and incredibly-low standards of living; nor is the result much softened by recognizing that the burden of responsibility is by no means theirs alone.

Some Research Guidelines

It is not enough, however, to identify and underscore the key problem areas. Considerations of manageability dictate further refinement of the research aims of a Canadian programme in the socio-economic-political field. The earlier emphasis on "Canadian capacity" and "comparative advantage" fills a substantial part of this need. There the case is made for uniquely-Canadian approaches generated by Canadian skills, but also for Western-based research that Canada's world posture equips it particularly well to undertake or sponsor. A number of important guidelines fit logically into this framework:

- (1) the research should be "remedy-oriented" -- so that its impact in the "tiers monde" may be maximized by rigorous policies implemented there and in the rich countries as well;
- (2) other things equal, priority should be given to research topics which lend themselves most readily to inter-disciplinary treatment -- since, in the long run, this is bound to be the

more successful route to an understanding of international-development problems;

- (3) the initial research focus should be on those countries where Canada's foreign aid is most heavily concentrated -- so that Canadian aid-giving experience may be directly tapped and influenced by the ongoing studies;
- (4) in large degree, research projects should be "region-oriented" rather than confined to a single country -- since, for most poor countries, real progress may well be less firmly tied to national growth than to the development of the region of which each forms a part;
- (5) preference should also be given to projects raising issues which extend beyond the region under study -- so that research findings may have the widest-possible application within the under-developed world;
- (6) the list of top-priority studies should be short and the overall research programme flexible -- since extreme selectivity is the only way to produce substantial results during the new programme's formative phase, while rigidity is the surest way to foreclose exciting new projects which the selection process may have missed.

Two of these guidelines -- "remedy orientation" and "inter-disciplinary treatment" -- deserve special emphasis. The distinction between "pure" and "applied" research is arbitrary at best, and today's pure research is not infrequently the applied research of tomorrow. It seems axiomatic, nevertheless, that if the proposed programme is to make its mark quickly and pointedly, it must enforce a ruthless self-discipline which confines research initiatives to problem-solving projects with a strong capacity for early "payoff" in remedial action. The other side of this particular coin is that, however delicate the task, such a programme must be prepared to exert sustained pressures for the implementation of its research findings by the relevant authorities in developing and developed countries alike. Tardiness or inaction on known solutions to serious problems is, indeed, often at the heart of failure in this field; and it is worth repeating that Canada is very well placed to assume a major role in softening this bottleneck to international development.

As for the inter-disciplinary approach, its adoption requires much more than uttering platitudes of the kind which praise motherhood and condemn sin. The real challenge here is that if the root causes of under-development are ever to be thoroughly understood,

they will yield only to a combined assault by a variety of scientific disciplines, particularly the social sciences -- and this, paradoxically enough, in an age when specialization within individual disciplines has become increasingly strong. No one, of course, could reasonably presume that a new Canadian programme could or should seek all the answers. What does make practical sense, however, is to give a special impetus to "team" projects which permit an interlocking of research effort by scholars from different disciplines. The results are likely to justify the added planning burden; and they are certain to strengthen the element of uniqueness in the programme's sponsored research.

THE RESEARCH PROJECTS

Turning now to specific research projects, it is apparent that they pose both the easiest and the hardest problems for this Paper. The underlying rationale having been described, no great skill is required to list topics worthy of investigation. On the other hand, the length of the list and the rank-ordering of topics are matters of considerable discretion; the choice is much facilitated, but not definitively settled, by the foregoing discussion. Still more difficult

is the job of spelling out the lines of research emphasis and methodology for each project; these cannot, in the nature of things, get a full airing until detailed plans are drawn up by the researchers who are to be intimately associated with particular projects.

Subject to such constraints, a list of suggested social-science projects is offered below. Where appropriate and feasible, comments will be made on substantive issues raised by the projects, preferred geographic focus, Canadian capability, and possible links with research programmes outside Canada.

The list is divided into two parts -- seven top-priority projects in the first group and five important projects in the second. There is, of course, no sharp line of separation: what is "top priority" for one observer may be "important" for another, and vice versa; moreover, subsequent investigation might call for a revised system of priorities. But this is not intended simply as a division of convenience. It reflects the judgment that a weighting of projects is essential in the context of any new research centre; and that while both groups are of real significance, the first is somewhat more directly aimed at the compelling problems of international development.

The Top-Priority Projects

Here, then, are the top-priority projects in the social sciences:

(1) The New Agricultural Revolution,

There has been an unfortunate tendency to equate the process of industrialization in poor countries with the development of manufacturing industries in the rich-country image. This has produced, among other things, a widespread neglect of agriculture's role in economic, social and political change throughout the "tiers monde." Only now is it coming to be well recognized that for many of these countries, given their resource base, there is no alternative to continuing reliance on the agricultural sector as a prime motive force in national development.

Meanwhile, technology -- in characteristic fashion -- has left social understanding far behind. A new agricultural revolution has been under way during the past decade, and production breakthroughs in some of the poor countries have already begun to make the difference between economic stagnation and rapid growth. The overwhelming need is to probe the sources and impact of recent agricultural advance, with a view to suggesting the kinds of socio-economic

development which will prolong and accelerate that trend.¹

Clearly, there are many facets of the problem to be explored. The following rank especially high: (a) the effects of the new seed and fertilizer technology on agricultural employment and output; (b) farmers' production responses to favourable price shifts and other economic incentives; (c) the changing pattern of expenditure flows between the agricultural and industrial sectors; (d) the efficacy of cooperative-type institutions as a device for mobilizing farmers' savings and productive energies; (e) the implications of heavy land taxation for the growth of output in the farm sector; and (f) the role of rural communities in political decision-making at the local and national levels. Each of these sub-topics could, indeed, consume the whole project, and considerable "whittling-down to size" will be necessary. In this connection, it is worth emphasizing that

¹ "The world is on the brink of an unprecedented opportunity," says William S. Gaud, Administrator of the United States Agency for International Development. "New inputs and infrastructure, new attitudes, adequate farm credit and sound policies are the active ingredients of this Green Revolution. And they are paying off. ... [But] the question is whether this promising state of affairs will continue -- whether ... this burgeoning agricultural revolution will become a part of the permanent order of things." Address to the Tenth Annual Conference of the Society for International Development, Washington, D.C., March 8, 1968.

the "Green Revolution" has so far had its greatest impact in Asia; and that India and Pakistan, the two largest recipients of Canadian aid, provide the richest testing ground for social-science research along such lines.

It is also very significant that there can be no doubting Canada's capability in this field -- through the University of Guelph and the Prairie Universities, for example, as well as the federal and provincial Departments of Agriculture. Nor is there any question as to the promising opportunities for Canadian research collaboration with knowledgeable agencies like the Ford and Rockefeller Foundations and the United Nations Food and Agriculture Organization.

(2) Education and Manpower Planning.

Canadians have become painfully aware of the restraints imposed on the nation's growth by poor educational planning and inadequate use of available manpower. But if the problem is serious for Canada, it is desperate for the many under-developed countries which have indulged in the luxury of wasteful human-resources policy.

"To put the matter bluntly, the educational systems of developing nations have been overtaken by a profound crisis, whose basic nature and causes are much the same all across the world. It is in essence a 'crisis of maladjustment,' between educational systems and their environments, brought

about by the failure of educational systems to transform themselves rapidly enough to match the changing needs and burgeoning demands of their swiftly changing environments. . . . The cure -- if there is one -- will at best be a long and complicated affair. . . . Still, a cure must be found, for without it the whole crucial business of nation-building and of social and economic development can be tragically retarded for generations to come."²

Planning authorities in much of the "tiers monde" have, in fact, chosen to face up squarely to these harsh realities, and educational growth over the past fifteen years has been quite remarkable. However, the critical problems remain largely unresolved, for several reasons. First, policy-makers are chasing constantly-moving and rapidly-expanding manpower targets. Second, highly-innovative and therefore elusive, strategies are required to produce a sustained flow of appropriate technical and managerial skills in a grossly-"undermanned" economy. Third, and by no means least important, the educational systems of developing countries have often spawned powerful vested interests that have prevented fundamental reform.

It would be foolish to expect that a Canadian programme would plug all of this massive breach. A number of international

² Philip H. Coombs, "The Challenge to Educational Planning," International Development Review, June 1968, pp. 7 & 8.

organizations are already engaged in substantial research efforts towards that end -- notably OECD, the UNESCO-affiliated International Institute for Educational Planning, and UNESCO itself. At the same time, it must be pointed out -- in all frankness -- that these efforts have barely scratched the surface in terms of providing operational guidelines for human-resources policy, and even less so in terms of securing or speeding up policy implementation in the poor countries. Furthermore, Canada has a research potential in this field which will bear comparison with that of any programme elsewhere: concrete evidence of this can readily be found in the ongoing activities of the Economic Council of Canada and the federal Department of Manpower and Immigration; and there are more than a few Canadian universities, like McGill and the University of Montreal, which timely encouragement could launch on sizable programmes of manpower research and planning.

For a start, then, a new programme might select a reasonably-homogeneous region in the less-developed world; and might sponsor a comparative study analyzing its systems of education and training, and making strong recommendations for policy changes that meet the demands of modernization. Probably looming large

among the topics for research would be (a) the techniques used for matching manpower supplies against needs, (b) relative pricing and other inducements for the more skilled human resources, (c) ways and means of increasing the productivity of industrial labour, and (d) problems of curriculum orientation and teaching methods in the schools and universities. The selected region should be one of Canadian-aid concentration; and preferably an area with the type of ethnic setting which could relate to Canada's bicultural experience. Algeria, Morocco and Tunisia -- with their French-Muslim heritage -- would seem to fit smoothly into this regional framework.

Such a study (or series of studies) might benefit greatly from research collaboration with interested non-Canadian agencies. It would, in any event, make a significant contribution to Canadian expertise on human-resources development. And it would set the stage for a vigorous Canadian effort aimed at the adoption of proposed remedies by the countries under review. Looking further ahead, one can envisage the possibility of a programme for multi-region research on manpower problems in poor nations.

(3) Urbanization and Unemployment.

"Industrialization typically leads to a concentration of investments upon one or two areas, while much of the

remaining national territory becomes locationally obsolete. A dualistic structure is thus imprinted upon the ... economy, comprising a 'center' of rapid, intensive development and a 'periphery' whose economy, imperfectly related to this center, is either stagnant or declining."³

This is an authoritative, if rather jargonese, statement of the well-known proposition that swift industrial advance breeds heavy flows of people and capital into the cities -- with consequent dynamic development there at the expense of the neglected countryside. In the present context, however, such a statement is incomplete on several counts: (a) it does not stress that while this phenomenon characterizes the development of rich countries as well as poor, the latter generally experience far greater extremes of regional imbalance; (b) it does not mention that, particularly in the poor countries, these urban concentrations tend to grow and persist long after this is justified by considerations of economic gain; and (c) hidden by the scientific language is the fact that the severe resulting poverty, unemployment and social tensions carry the seeds of deep political unrest and violent revolution.

³ John Friedmann, Regional Development Policy: A Case Study of Venezuela (Cambridge, Mass.: The M.I.T. Press, 1966), p. 9.

Let there be no mistake about the gravity of the problem, nor about its dimensions. In every part of the under-developed world, governments are struggling to cope with this "urbanization" crisis. Success, in general, has been either fleeting or conspicuous by its absence. And it takes no more than a Calcutta, or a Lagos, or a Rio de Janeiro to substantiate the judgment that many of the difficulties may well be intractable.

Why, then, should a Canadian programme jump into this socio-economic and political "hornet's nest" -- bearing in mind, also, that North Americans are already plagued with their own "crisis of the cities?" In the broadest terms, the answer is that no sizable "tiers monde"-oriented research organization can afford to ignore it. More specifically, it seems clear that the Canadian programme could play an important catalytic role in marshalling the relevant social-science interests now to be found in various Canadian universities; marrying them with the appropriate skills of Canadian architects, engineers and town planners; and sponsoring carefully-defined research on urban development, possibly in association with expert non-Canadian agencies like the Joint Center for Urban Studies of Harvard University and the Massachusetts Institute of Technology.

Again, and especially in this vast field, there will be real limits on what a Canadian programme can profitably do. Perhaps the wisest initial course to follow would be to set up a "pilot project" aimed at a few of the newer areas of urban concentration -- where the problems, though serious enough, have not yet been thickly encrusted with chronic suffering and frequent failures in remedial policy. Nairobi (Kenya) and Dar-es-Salaam (Tanzania) appear well suited for selection on these grounds, and in the light of such other criteria as Canadian-aid emphasis and region-oriented research. Each city would receive an in-depth treatment probing (a) the causes of urban concentration, (b) the scale and pattern of unemployment, (c) the impact of school-leavers on the labour force, (d) the transport system, (e) the channels of commodity distribution, and (f) the development of housing and real estate -- all with a view to maximizing orderly urban growth and minimizing the socio-economic hardships of the unemployed.

The University of Toronto and, to some extent, McGill University and Loyola College have already begun to build social-science expertise on East Africa. This could provide the nucleus for a viable sponsored research project on "urbanization and

unemployment." Moreover, it seems not too much to hope that, with cautious expansion, a city-by-city approach along these lines could materially strengthen parallel research efforts under way outside Canada.

(4) Promoting Exports and Private Foreign Investment.

The poor countries' drive towards industrialization has also had major implications for their competitive position in the world economy. To a considerable degree, these have taken a negative form.

In point of fact, the burden of responsibility is a shared one. The rich nations have paid long and loud lip service to the idea that their markets must be opened wide to the exports of the "tiers monde." For the most part, however, the actions have fallen, and continue to fall, far short of the words -- and this despite the glaring lack of logic in any policy which combines foreign aid with tight restrictions on imports. What is more, total flows of aid have become disturbingly weak in recent years -- so much so as to give the poor countries good cause for skepticism about competition and specialization along the broadest international lines.

Two additional kinds of concern have coloured their whole development strategy: first, the conviction that deteriorating commodity terms of trade have drastically reduced their living standards and have stunted their economic growth; and second, the belief that large-scale inflows of private capital might be incompatible with national independence. Armed with these fears, and with those on aid and market access, the developing countries have often embarked on programmes of import substitution and foreign-capital restraint that go much further than economic self-interest would warrant.

It is not for a new programme to tackle all these problems or to set all the irrational fears at rest. For one thing, increased foreign aid and wider access to markets are not primarily the business of research, but matters of governmental negotiation and action; it is for the Government of Canada, with its relatively clean hands, to exert the greatest possible pressures towards this end. Secondly, the political aspects of private foreign investment raise a host of issues which are very difficult to define and even more difficult to assess; Canadians have had enough trouble trying to understand the politics of foreign investment in their own economy. As for the terms

of trade, this field has already been well tilled, if not "over-tilled," and the research findings remain, in large measure, inconclusive; it is time to take a deep breath and await the development of fresh insights and new approaches to the problem.

For present purposes, it seems sufficient to emphasize that rapidly-rising exports and substantial private-investment inflows are necessary conditions for self-sustained growth in the under-developed world; and that many poor countries have submerged this truth in a sea of inward-looking economic policies which are frequently inconsistent with the growth objective. It follows that there is an important place for research designed to stimulate exports from, and private foreign investment in, the less-developed nations.

The information gaps are especially wide in relation to their potential for manufactured exports, and to the types of foreign-investment incentives and ventures best suited to particular regions. Once again, the current research landscape is by no means empty. There is UNCTAD, with its direct interest in "tiers monde" trade; there is the International Trade Centre, jointly operated by UNCTAD and GATT to encourage export growth; there is UNIDO, with its programme for industrial development; there is the United Nations

itself, with its continuing efforts to increase private-investment flows to the under-developed countries.⁴ But most of these initiatives are quite new, the problems are many, and the research has yet to be sharply focused. Given Canada's rich trade and foreign-investment experience, a Canadian programme should easily be able to find its niche.

Perhaps the most promising start would be to take a route already opened -- in the Caribbean, which has the triple advantage of limited size, close aid and historical ties with Canada, and relative neglect by research agencies outside this country. McGill University and the Private Planning Association of Canada have undertaken general studies in the trade field;⁵ while the External Aid Office has begun to explore Canadian investment prospects in Caribbean countries. Then, too, Canadian economists have served there with official study missions;⁶ and Canadian businessmen and civil

⁴ See the latest U.N. study, Foreign Investment in Developing Countries (New York, 1968).

⁵ See, for instance, Kari Levitt and Alister McIntyre, Canada-West Indies Economic Relations (Ottawa: Mutual Press Limited, 1967).

⁶ A notable recent example is the Canadian-U.K.-U.S. economic mission; see Ministry of Overseas Development, Report of the Tripartite Economic Survey of the Eastern Caribbean, January-April 1966 (London: H.M.S.O., 1967).

servants have acquired considerable expertise on Caribbean trade and development problems. The time is ripe for a careful "team" examination of barriers to effective export performance and foreign investment in selected Caribbean areas -- with a view to suggesting concrete remedies and actively seeking their adoption. There is every reason to believe that, with appropriate links to related research elsewhere, there can be important extensions of this group approach throughout the Caribbean and beyond.

(5) Problems of Regional Integration.

The "integration" issue is really cut out of the same research cloth as the question of "export-investment promotion." That is to say, economic integration can here be viewed as a pooling device for bringing the same benefits more efficiently to the several countries comprising a specified region.

A huge literature has grown up around this subject in recent years. It ranges all the way from philosophical discussion of alternative forms of integration to the most technical analysis of economic effects within and outside the union. There has also developed a kind of folklore which sometimes verges on proclaiming integration as the greatest human advance since the printing press --

the panacea for most or all of the ills now plaguing the under-developed countries.

But this is not the place to plunge into such deep waters or to set the balance right. Suffice it to put forward the following central propositions: first, that regionally-integrated trade and investment activity can produce very substantial economic, and perhaps political, gains in the "tiers monde;" second, that for a variety of reasons often difficult to comprehend, the developing countries have as yet come nowhere-near to fully tapping this potential; third, that inclusion of one or more developed countries within an integrated unit may significantly enlarge the scope for gain on both sides; fourth, that integration experience and prospects in the less-developed world have to be judged more in terms of new industries and new skills than of the existing economic structure; fifth, that such judgment need not, and should not, be an "open sesame" to indiscriminate justification of integration schemes and policies; and finally, that no economic union is immune to the danger of inward-looking policies so extreme as to nullify the prodigious gains accruing from international competition and division of labour.

These hypotheses, it is suggested, can provide the conceptual framework for a selective, sponsored research programme on "problems of regional integration." Once more, it is necessary to acknowledge that other organizations, like UNCTAD and the Inter-American Development Bank, are now active in this field. And once again, it is necessary to emphasize that there is plenty of room for a properly-focused Canadian effort -- particularly in the Caribbean, which has already attracted considerable Canadian social-science talent; and where the University of the West Indies has fostered impressive, indigenous research on economic integration.⁷

Special interest surrounds the events leading up to the establishment and early dissolution of the West Indies Federation. In large measure, the economics, the politics and the sociology of this complicated story remain to be told.⁸ They are bound to shed strong light on the high-potential sectors for integrated Caribbean

⁷ In the latter connection, see Havelock Brewster and Clive Y. Thomas, The Dynamics of West Indian Economic Integration (Jamaica: Institute of Social and Economic Research, 1967).

⁸ Sir Arthur Lewis, former Vice-Chancellor of the University of the West Indies and currently Professor of International Affairs at Princeton University, has apparently been probing these events for some time. His findings should prove very useful indeed.

development, and on the institutional arrangements best calculated to achieve it. In fact, all three areas -- Federation history, "growth poles" and new institutions -- constitute a viable and challenging research target for the proposed programme. It would be surprising if such a project did not give a new "policy" dimension to the existing literature on Caribbean integration; and if it did not facilitate further research initiatives on integration in other less-developed regions.⁹

(6) Family-Planning Experience.

Population growth in the poor countries has long been like the weather: everyone talks about it, and virtually no one does anything to control it. The damaging effects of this "population apathy" have cumulated over many decades, and the opportunities foregone can never be restored. But if the past is tragic, the future is heavy with the uncertainty of harsher things to come.

"Recent years have been witnessing a veritable demographic revolution, the pace and dimensions of which

⁹ The McGill Centre for Developing-Area Studies is about to launch a study of the regional economic implications of selected national development plans in Latin America; Dr. Jaleel Ahmad, presently a Senior Research Associate at Harvard University, will be the author. See, also, the McGill study by Nicolas G. Plessz, Problems and Prospects of Economic Integration in West Africa (Montreal: McGill University Press, 1968).

are without precedent anywhere in the world. ... The mechanism of this new ... trend is simple. Mortality rates have declined sharply, while fertility rates have remained, on the whole, at the very high levels that seem to have prevailed as far back as any reliable estimates exist. The rates of natural population increase -- and of reproduction -- have therefore gone up suddenly and rapidly, reflecting to the full the decline in mortality."¹⁰

The crisis is probably most acute in South Asia, China, North Africa and the Caribbean. Particularly in India and Pakistan, surging population-growth rates -- far in excess of those anticipated -- have forced drastic revisions in planning strategy, have severely constrained the rise in per capita income, and have set the stage for problems of unemployment even more serious than those already undermining national stability.

Solid remedial efforts are under way, to be sure. Western science is well on the road to developing cheap, safe and simple contraceptive devices that are usable everywhere in the underdeveloped world. Family-planning programmes have begun to overcome mass hostility and suspicion in a number of countries; and foreign agencies -- notably the Population Council, the Ford Founda-

¹⁰ Gunnar Myrdal, Asian Drama, Vol. II, pp. 1390 & 1391.

tion, U.S.A.I.D., the Swedish Government and the World Health Organization -- are now working actively to increase the effectiveness of birth-control policies in the "tiers monde." However, it is one thing to produce the technical device, and even to arouse local sympathy towards its use, but quite another thing to produce the mass enthusiasm and the dynamic administration that are vital to success. It is primarily in these fields of motivation and administration that an enormous job remains to be done; and there is ample scope for Canadian initiative.

A new Canadian programme could sponsor a series of "pilot studies" evaluating family-planning experience in selected areas of India and Pakistan -- and perhaps Ceylon, a substantial recipient of Canadian aid and unique in South Asia for the high quality of its public-health facilities. Among the key topics to explore for each region would be (a) the pattern of change in population size and structure, (b) links between the birth rate and rising standards of living, (c) attitudes and responses to new birth-control measures, and (d) ways and means to improve and invigorate family-planning administration.

Whatever the "population payoff" -- sharply-declining birth rates -- lacks in immediacy, it gains in the certainty that effective family planning now will promote increased economic welfare in the decades ahead. And there is the important fact that Canada possesses considerable research potential for this task -- in the demography-oriented Department of Sociology at the University of Western Ontario, for example;¹¹ also in the federal-government Bureau of Statistics, and the Department of Demography at the University of Montreal. A modest investment in such resources, and in appropriate links with research agencies outside Canada, would give promise of large dividends on the crucial population front.

(7) "Racialism" and Economic Development.

It would be comforting to believe that new nations will typically "defuse" their own internal tensions in order to meet the overriding challenge of economic development. But it would also be unrealistic, and indeed dangerous, to assume that preoccupation with the growth problem guarantees the triumph of reason over passion

¹¹ Prior to becoming Department Chairman, Dr. John F. Kantner served for some years as a demographic specialist in the Population Council.

in the poor countries. If this kind of victory is possible at all, it will come only when the development process is sufficiently advanced to create a favourable economic climate for resolving social conflicts; and in any event, it will not come easily or quickly, as Germany in the 1930's and the United States in the 1960's illustrate in such vivid fashion.

A distinguished West Indian has put the issue in proper historical perspective:

"Every society has to learn to rise above its divisions, whether of class, race, religion, language or tribe. ... What in the end does the trick is economic development, which abolishes both the vertical and the horizontal divisions. ... The developed societies are much further along this road, and have had the advantage of being able to take their problems one by one. ... We in the new states suffer more because we have to fight on all these fronts simultaneously. Our different tribes, classes, religions, languages and races have decided to fight each other all at the same time in this one short moment of history. This is why our countries seem so angry: they are full of leaders shouting at each other all the time about so many different things. ... The end of [all] this [may well be] the class-less detribalised society, where nobody cares what race or religion you belong to. ... [But in the meantime] the ethical and cultural values which we seek to preserve are like a thin veneer, easily rubbed off by mass hatreds and ignorance."¹²

¹² Sir Arthur Lewis, Chancellor's Installation Address at the University of Guyana, Georgetown, January 25, 1967, pp. 10, 12, 13.

Nigeria is only the latest tragic example of the enormous social costs imposed by rampant "racialism" in the under-developed world.

This problem runs deep, and it is not going to vanish overnight like the rain-clouds in a hot summer sky. But without an early forward momentum, there can be little ground for optimism about long-term progress in the "tiers monde." Apart from economic growth itself, the prime need is clear insight into the basic forces at work, and remedial policies attuned to the special circumstances of each region. To some extent, of course, the tensions and conflicts are themselves an economic phenomenon -- gross income disparities among various groups, differential access to the most lucrative and most prestigious jobs, discriminatory tax and tariff treatment, and so on. But there is a great deal more -- unequal educational opportunity, restrictive language policy, lop-sided group participation in political decision-making, culture-based denial of civil and religious rights. And there is the acute problem of harmonizing diverse group attitudes and skills during the critical years when a more balanced development is being fostered through public policy.

In these topics are the makings of a significant research venture on the interplay of racial and cultural forces in selected poor countries. It seems altogether fitting that a new Canadian programme -- given Canada's history and the lessons Canadians are learning from their own mistakes -- should assume a key role in this vital field. Indeed, much of the raw material for such research should soon be readily available in the massive documentation of the Royal Commission on Bilingualism and Biculturalism.

As usual, it will be necessary to refine the project down to manageable size, and particularly to settle the question of geographic scope. In the latter context, a variety of places would be logical choices for Canadian emphasis, but perhaps none more so than the following: Guyana and Trinidad-Tobago, whose problems of race and national origin are possibly the most serious in the entire Caribbean; Ceylon, where recent language restraints have severely aggravated an already-tenuous relationship between the Buddhist-Sinhalese majority and the Hindu Tamils; and Nigeria, where an early truce in the civil war now appears likely, but where the persistence of bitter inter-group strife would be fraught with the gravest dangers for political stability throughout Africa. As for the refined

choice of research topics and techniques, it is well to keep in mind the real benefits that can derive from close collaboration with non-Canadian agencies; a notable case in point is the Centre for Multi-Racial Studies, jointly operated in Barbados by the University of the West Indies and the University of Sussex (England).

Other Important Projects

A supplementary listing of research projects for a Canadian programme is now in order. Here again, there can be no magic number of important studies, and no system of logic can completely rid this choice of arbitrary elements. What is offered, in fact, is an illustrative "short list" of projects -- very briefly discussed -- which appear to be broadly consistent with the guidelines set out above.

(1) The Role of the Military in Developing Countries.

This is surely one of the more fascinating aspects of nation-building in the "tiers monde." The armed forces have played, and continue to play, a multitude of parts there -- sometimes heavily positive, sometimes largely negative, nearly always in sharp contrast to the role of the military in developed states. There is much

to be learned from comparative studies of the military before and after independence in selected new nations of South and Southeast Asia as well as West and East Africa -- and perhaps, also, the military in the older political setting of Latin America. McGill University is currently preparing to sponsor a study along these lines.¹³

(2) Development Planning and Economic Growth.

Comprehensive economic planning has become a central fact of life throughout the less-developed world. This being so, it is not surprising that a voluminous literature has grown up around the techniques of planning in the poor countries. The curious thing, however, is that so little is yet known about actual planning experience in the new states -- the planning process, the problems of plan implementation, the impact of planning on economic performance, the lessons to be drawn from errors in plan formulation and execution. Countries like India, Pakistan, Ghana, Tanzania and Brazil immediately suggest themselves for special attention. There are substantial

¹³ It is expected that the study will be conducted over a two-year period by General J.N. Chaudhuri, presently India's High Commissioner to Canada and a former Chief of Staff of the Indian Army.

research skills to be tapped in the Economic Council of Canada, and in such universities as Toronto, Western Ontario, McGill, Montreal and British Columbia. Furthermore, it is not at all inconceivable that the research would have strong "feedback" effects on Canadian economic planning.

(3) The Role of Bureaucracy in the Development Process.

For various reasons, national policy-making has rested on a very narrow base in many of the less-developed countries. In particular, stunted educational growth and intensive concern with subsistence needs have conspired to deprive the masses of the best opportunities for effective participation in the political process. The civil service has filled this gap to a striking degree -- and much more so than in the developed world. For good or ill, it is the government bureaucracy which has often held the life-and-death power over socio-economic and political change in the poor nations. How the bureaucracy has developed, how biographical and social factors have shaped the innovative capacity of its leading members, how far they are likely to build the domestic institutions essential to solid progress -- these are among the core questions to be answered, in comparative terms, for selected countries in the Caribbean, South Asia and West

Africa. Canadian research beginnings have already been made in this direction, notably at Queen's University;¹⁴ the new programme would do well to strengthen and expand such important initiatives.

(4) Criteria for Aid-Giving.

There is something to be said for delaying a frontal attack on problems of foreign-aid policy and programming in the developed and developing countries. The major issues are no less complex than they are significant. But be that as it may, there is good reason to suggest a sponsored study of criteria for donor decisions on amounts, types and geographic allocations of economic assistance to the "tiers monde." Until now, this topic has suffered from an over-supply of loose, poorly-articulated and mutually-inconsistent ideas. It may be that there is no logical system of criteria; and that no satisfactory tests of economic performance in the aid-receiving country can be devised. However, even if this turns out to be so there will have been at least provided a systematic airing of problems in a confused sphere of public policy.

¹⁴ Dr. Khalid B. Sayeed, Professor of Political Studies, is working out a general framework for comparative research on the role of bureaucracy in modern and modernizing states.

Alternatively, there could emerge -- with modest expense and relative speed -- a comprehensive and authoritative guide to more rational decision-making by aid-giving countries and international agencies.

(5) Political Systems and Economic Development.

An intriguing question about development has to do with the types of political structure best calculated to induce rapid and sustained socio-economic change in the poor countries. Perhaps the only clear starting premise is that Western-style representative government cannot be effectively transplanted in the "tiers monde" without substantial adaptation to local circumstances. The above comments on the special role of the military and the bureaucracy serve to reinforce this basic point. But they do not bear fully on two prime concrete issues: how well particular systems of law-making and law enforcement in poor countries promote their overall development goals; and what forms of adaptation are most likely to produce a reasonable balance among political stability, economic performance and broad participation in the development process. Canadian federalism may have much to offer -- all the more so in relation to parliamentary systems like India, Malaysia, Nigeria and the Caribbean countries

formerly linked to Great Britain. And a Canadian programme would be able to draw on a wealth of Canadian-university research skills in law, political science and the other relevant disciplines.

CONCLUDING REMARKS

It remains only to make a few concluding observations. These amount, essentially, to an underscoring of certain key points that are implicit throughout the Paper.

First, the list of suggested projects is neither a research blueprint nor a call for simultaneous launching of all the studies. Changes in research emphasis -- and in choice of topics -- are very likely to emerge from continuing discussion and actual experience. Moreover, given the severe scarcity of skilled human resources, even the most liberal financing would not permit a new programme to proceed at once on all social-science fronts. What is submitted here is, rather, a tentative "research menu" which will have to be carefully adjusted and sampled in order to avoid "project indigestion."

Second, each project will typically prove to be a composite of several studies. This means, of course, that the "menu"

is considerably more varied than the formal list suggests. But it also means that it will be possible to link studies under a number of central themes. And this -- together with concentration on major recipients of Canadian foreign aid -- will enhance both the logic and the manageability of the new research programme.

Third, these benefits are further increased by other linkages. That is to say, the twelve proposed research projects raise a substantial number of interlocking issues -- for example, problems of labour productivity, under "education and manpower planning" as well as "urbanization and unemployment;" also, problems of nation-building, under "the role of the military" and "political systems and economic development." Then, too, there are important research links to be exploited by the social-science projects and other main areas of Canadian interest -- as between "transportation" and "regional integration," for example; between "communications" and "racialism;" and between "agriculture" and "the green revolution."

Fourth, in the present context successful research requires two kinds of intensive "follow-up" effort. It will be necessary to engage in periodic re-evaluation of project

techniques and findings -- so as to ensure steady improvement in the quality of its studies. It will be equally necessary to make an ongoing appraisal of research achievement in the form of remedial action taken by the appropriate authorities -- so as to ensure maximum impact on problems of international development.

Finally, and perhaps most important, a new Canadian programme will have to contend with deep sensitivities in the social-science field. Topics dealing with socio-economic and political change can, and sometimes do, arouse serious concern in developing countries anxious to create a positive image abroad. It is, therefore, vital that the closest liaison be maintained with host governments and educational institutions -- not only on the administrative formalities of visits by programme supported scholars, but also in terms of seeking advice and collaboration in the host countries. Needless to add, such ties would make Canada's research programme far more meaningful and relevant than it could possibly be otherwise.

APPENDIX "C"

SCIENCE POLICY STUDIES AND A CANADIAN PROGRAM
OF INTERNATIONAL DEVELOPMENT

C. H. G. OLDHAM
Senior Research Fellow,
Science Policy Research Unit, University of Sussex

Science Policy Studies and a Canadian
Program for International Development

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Science Policy Studies and a Canadian
Program for International Development

One of the most important developments in the industrialized countries since the Second World War has been the recognition by governments that science and technology are powerful tools in solving national problems. This recognition has led to vast increases in government expenditures on science. But despite the sums of money spent, there are still more problems and ideas for their solution than there is money available. A second development, of only a few years duration, has been the recognition that there must be policies which guide the allocation of funds for science. These policies should seek to optimize the economic, health, welfare, cultural, political, and military returns to the country from the investments in science. Collectively these policies, which determine priorities and aim to improve the productivity of both the creation and use of knowledge, have become known as a nation's science policy.

Similarly at the level of the firm, managements are seeking to understand the ways in which research and development contribute to the success of the firm in domestic and world markets. They too must formulate rational policies to guide their expenditures on science.

At both levels, the nation and the firm, the success of the science policies depends on the level of understanding of how science and technology contribute to the attainment of goals, and on how this understanding is converted into specific policies. This situation has led to the beginning of a third development, and this is the recognition that research is needed to improve both

the level of understanding and the methodology for formulating policies. Science policy research is now carried out in several universities, international organizations, government departments, and in private institutions.

The recognition that large sums of government money should be spent on science, that it should be spent rationally, and that there is a need for research on how to define rational policies, have all taken place in the more industrialized countries. For the most part the developing countries have neglected science. Ninety-five per cent of all the world's annual expenditures on science take place in the thirty most industrialized countries. The rest of the world accounts for the remaining five per cent.

The potential contributions of science and technology to the solutions of the problems of the developing countries are, however, enormous. For many problems appropriate technologies exist in other parts of the world, and what is required is a transfer and diffusion. For other problems there are no existing solutions, and only research can provide the answer. But whether research is required or absorption of foreign know-how is sufficient the developing country must have its own indigenous scientific and technological capabilities.

Just as the governments of the industrialized countries have had to finance most of the nation's scientific activities, so in developing countries the governments must provide the bulk of the finance. And just as a science policy is required in the industrialized countries, so too must the developing countries build up their scientific institutions and determine priorities according to

a well defined policy. The alternative is an ad hoc growth of science which in the past has been governed mainly by the state and requirements of science in the advanced nations rather than by what the developing country 'needs'. A part of the science policy process must be to define these needs.

Science Policy and Science Aid

Technical assistance has always been an important component of most donor countries aid programs. Some extremely valuable contributions to development have resulted from this type of aid, but for the most part the results have fallen short of expectations. There are many reasons for this, but one of them is undoubtedly because most of the recipient countries have no clear idea about what types of science and technology are required. The aid projects tend to be ad hoc; their impact on development is slight and frequently there is no continuing program after the technical assistance is finished.

If the recipient country had its own science policy which indicated priorities and showed how the scientific institutions were to grow, then science aid could be provided to help implement the policy. In this way the aid would be relevant to needs and would be likely to be more effective.

The sort of aid which is required falls into two categories. The first is the transfer of technologies of a type which are appropriate to the needs and requirements of the developing country; requirements which should be defined in the science policy studies. The second is aid to help establish an indigenous scientific capability in the developing country. This is necessary because

without its own science a country must always be dependent on foreign assistance. An indigenous scientific capability will help the country to define and solve its own problems, help provide the 'receiving stations' for foreign technology, and will help to provide the social milieu which is so essential for modernization and development.

Aid to provide appropriate technologies is itself of two kinds. First there is the transfer of existing technology. Second there is aid to create new technologies, which can be either adaptations and modifications of existing techniques, or can involve research and development to produce radically new technologies. But whether the transfer involves prior research or not, it is vitally important that the technologies be appropriate for the needs. All too often in the past the transfer has been of technologies designed for industrialized societies in temperate regions, rather than for agricultural societies in the tropics.

The science policy of the developing country, by defining the country's scientific and technical 'needs' should thus provide the basis for a donor country's science aid policies.

The science aid policies of donor countries themselves could have a significant impact on the science policy of their own country. If a major science aid effort is mounted then many scientists and engineers will be required over and beyond what the country requires for its domestic science programs. This requirement must be catered for in its own science policy and manpower plans.

A Science Policy Research Program for
a Canadian International Development Program

(a) The Problems

A balanced science policy research program should have at least two components. In the first place it should have a basic component which is aimed at obtaining a better understanding of the complex inter-relationship between science, and economic and social change. This understanding will help in the formulation of better science policies, but like basic research its pay off is uncertain and relatively long range. Secondly, the research program should have more limited objectives aimed at providing the knowledge and tools which the science policy maker uses in the formulation of policy. This type of study is akin to applied research.

A third possible component might be a pilot plant stage where the insights gained from the other stages are tried out under field conditions in a specific developing country. In this way help could be provided to a developing country to formulate its science policy.

The first, or basic component, is particularly important in the context of the developing countries. Research is required to identify the factors which are conducive to innovation, and those which oppose and resist innovations. This will require a careful analysis of a number of successful and unsuccessful innovations in different sectors of the economy and in different societies.

Most of the basic work that has been done on the economics of innovation and the sociology of science has been done in the context of the industrialized societies. This work needs to be extended and adapted to the context of the developing societies.

For example, it has been suggested that science is an extremely important catalyst in helping to overcome tradition and superstition. Without a general mass understanding of science, scientific research and innovation may have little impact on the society. It is important that this phenomenon be better understood, because on its validity rest policy decisions on how much of a country's resources should be devoted to popularizing science.

At the more applied level the objective would be to help provide the methodological tools and information required by science policy makers. The following are some of the more important problems which require solution:

- (1) How should science planning be related to economic planning. How can those sectors of the economy be identified which are in most urgent need of technological change.
- (2) How can the technology most appropriate for local needs be identified.
- (3) What factors should be considered in the decision of whether to import a technology from abroad or to carry out domestic research and development.
- (4) What is the best organizational framework for science given the local economic, social, and political structure.
- (5) How can the effectiveness of the country's science system be measured - and improved. What are the conditions which enable a good scientist to do creative work in the environment of a developing country.
- (6) How can the country's scientific and technical manpower requirements be estimated and how should they be met.
- (7) What are the best ways of popularizing science and integrating the science system with the economic and social system in the country.
- (8) What are the most effective ways of diffusing new technologies throughout the society.
- (9) How much basic research should be carried out in a developing country.

(b) Methods of Attack

Several different lines of attack will be required to solve the problems identified above.

Some of the problems are theoretical and will require the development of analytical techniques and the application of operation research and systems analysis to the problems of planning and cost benefit studies.

Other projects will involve the analysis of data gathered on part of the Canadian program, such program should therefore aim to collect statistics about scientific manpower and expenditures from all developed countries and to keep this recorded in a data bank. Other information about the structure, composition and effectiveness of science councils, and research organizations, should be collected, so that it will be available for comparison and analysis. In fact, whenever possible information relevant to the innovation process should be quantified and stored.

A third set of problems will require field investigation. One such research program should be to assess the ways in which technology is currently transferred from developed to developing countries. The first phase of this study should be a detailed analysis of the experience of Canadian firms in transferring their technology and know-how to enterprises in developing countries. This should be done industry by industry, and will require investigation in both Canada and the appropriate countries overseas. The objective will be to learn from past experience and to find ways to promote the effective transfer of more appropriate technologies, and at the same time to ensure that there are mutual benefits for both the Canadian and foreign enterprises.

Field investigations and case studies must also be made to find solutions to many of the other problems. These problems were stated in general terms, but their solution will require very specific investigations. For example, field studies will be required to identify the relevant factors which must be considered in the definition of "appropriate technologies", and in the analysis of factors encouraging and hindering innovation.

A fourth approach will be to make analyses of the science policies of selected countries with the objective of evaluating the development lessons to be learned from these countries. In some instances the studies may be historically oriented so that the lessons from the past can also be evaluated. Countries which warrant such studies include; Japan, China, India, and Mexico.

(c) Organization

The details of the organizational arrangements for science policy studies will depend on the organization of the program as a whole. However, certain elements of a science policy program can be suggested:

- (1) There would be a group based at the program headquarters which might have the following functions:
 - (i) Compilation of data
 - (ii) Analysis of data, and theoretical studies
 - (iii) Identification of both problems and suitable individuals and organizations for placing contract research.

- (iv) Evaluation of contracted research
- (v) Disseminating the results of the research
- (vi) Organizing conferences. Some would be research conferences and others would have a wider education function.
- (vii) Carrying out special feasibility studies of large inter-disciplinary projects - such as large river basin development projects.
- (viii) Evaluating the science policy implication of other research programs supported by the program headquarters.

- (2) Research programs could be contracted out to University groups and other organizations. Wherever possible investigations which require field studies should be done jointly by teams from both developed and developing countries. It is also important that many of the projects be contracted with Universities, since the training of new talent for science policy investigations should receive high priority.



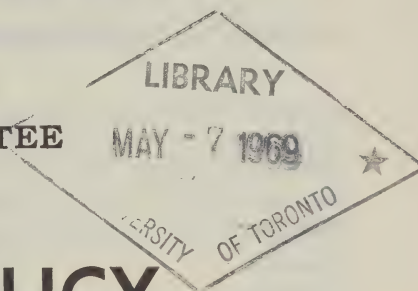
First Session—Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*

The Honourable DONALD CAMERON, *Vice-Chairman*

No. 33

THURSDAY, FEBRUARY 27, 1969

WITNESSES:

Central Mortgage and Housing Corporation: H. W. Hignett, President;
A. J. Hazeland, Chairman of the Advisory Group; R. T. Adamson,
Executive Director and Chief Economist, and A. E. Coll, Executive
Director.

APPENDIX:

34.—Brief submitted by Central Mortgage and Housing Corporation.

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C. moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,
The Honourable Senator Lamontagne, P.C. moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceeding of the Senate, Wednesday, February 5th, 1969:

“With leave of the Senate,
The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Thursday, February 27, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Blois, Bourget, Carter, Giguère, Grosart, Haig, Kinnear, and Robichaud.—(9).

In attendance:

Philip J. Pocock, Director of Research (*Physical Science*).

The following witnesses were heard:

CENTRAL MORTGAGE AND HOUSING CORPORATION:

H. W. Hignett, President;
A. J. Hazeland, Chairman of the Advisory Group;
R. T. Adamson, Executive Director and Chief Economist, and
A. E. Coll, Executive Director.

(A curriculum vitae of each witness follows these Minutes:)

The following is printed as Appendix No. 34:

—Brief submitted by Central Mortgage and Housing Corporation.

At 5:30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Hignett, Herbert William, M.B.E.—H.W. Hignett, M.B.E., joined Central Mortgage and Housing Corporation at its inception in 1946 taking over the post of branch manager at Winnipeg. Three years later, he was appointed Prairie Regional Supervisor and served in that capacity until assuming the position of Ontario Regional Supervisor in 1953. He was appointed an Executive Director at head office in Ottawa in 1957, the position he occupied until his appointment, in October 1963, as Vice-President. He became President in July 1964. Mr. Hignett was born on January 20, 1913. He received his education in Winnipeg and was graduated from the University of Manitoba in 1936 with a Bachelor of Science degree in Civil Engineering. After his graduation, Mr. Hignett received an appointment with the Engineering Department of Winnipeg and worked with their construction division for the next four years. In 1940 he enlisted with the Royal Canadian Engineers and attained the rank of Major prior to his retirement from the service in 1946. He was made a Member of the Order of the British Empire in recognition of his Army Service. He is a member of the Professional Engineers' Association of Ontario, the Engineering Institute of Canada and the Military Engineers' Association.

Hazeland, Andrew John Manning, widely experienced in the architectural field, A. Hazeland has been with Central Mortgage and Housing Corporation since it commenced operations in January, 1946. Born in Hong Kong on November 30, 1908, Mr. Hazeland received his early education at the Chefoo School in China and then came to Canada to attend the University of Toronto in 1927. Receiving his Bachelor of Architecture degree in 1931, he joined Mathers and Haldenby Architects in Toronto. A year later, Mr. Hazeland went to the Far East to take up the position of Chief Architect with Hazeland and Gonella Civil Engineers in Hong Kong. In 1935, he returned to Canada and accepted a position with Connaught Laboratories, University of Toronto, as architectural designer. After two years with the University of Toronto, Mr. Hazeland set up a private practice in Toronto. In 1940 he joined the Engineering Department of the Aluminum Company of Canada at Montreal. He remained with that company until 1942 when he was appointed to the Canadian Division of the War Production Board in Washington and carried out his duties there for three years. In 1946 he joined Central Mortgage and Housing Corporation as Assistant General Supervisor, Construction Division. In 1950 he was appointed an assistant secretary. In 1955 he was named Advisor on House Design. In 1968 he became Chairman of the Advisory Group.

Adamson Robert T.—Robert T. Adamson, Executive Director and Chief Economist, was born in Winnipeg, Manitoba. He is a graduate of the University of Manitoba (Bachelor of Arts—1943) and the University of Toronto (Master of Arts—1946). Prior to joining Central Mortgage and Housing Corporation in 1947, Mr. Adamson was on the staff of the University of Toronto as research assistant with the Toronto Metropolitan Housing Research Project. Mr. Adamson joined the Corporation as assistant statistician, Economic

Research Department, Head Office, and in 1950 was appointed Supervisor of the Department. He was named Chief Economist for CMHC in 1955 and that same year became a member of the newly created Advisory Group. In 1960, when the Economic Research and Statistical Departments were combined to form the Economics and Statistics Division, the new Division was placed under the Direction of Mr. Adamson. In July 1965, he was appointed an Executive Director of the Corporation, assisting the President on policy matters and special activities, while continuing as a member of the advisory group and Chief Economist.

Coll Alfred E.—A. E. Coll came to Canada for the first time in 1941 as a member of the Royal Air Force. On retirement from the air force, with the rank of Squadron Leader at the end of the war, he returned to Canada to take up permanent residence. A native of Gibraltar, Mr. Coll is a Law graduate from Middle Temple, London, England. Mr. Coll joined CMHC in 1947. In 1949, he was appointed regional property manager for British Columbia Region. In 1950 Mr. Coll was appointed assistant general supervisor, Real Estate Division, head office. He became supervisor, Mortgage Administration Department, in 1953. In 1955, he was named advisor on public housing and on March 13, 1959, he was named director, Urban Renewal and Public Housing Division. He was named supervisor of the Prairie Region in November, 1964. After a year at Laval University in Quebec City, participating in the government's special bilingual program, he was appointed as an Executive Director in July, 1968.

THE SENATE
SPECIAL COMMITTEE ON SCIENCE POLICY
EVIDENCE

Ottawa, Thursday, February 27, 1969.

The Special committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (*Chairman*) in the Chair.

The Chairman: Honourable senators, we have the pleasure of receiving this afternoon the representatives from Central Mortgage and Housing Corporation. This delegation is headed, as it should be, by its President, Mr. H. W. Hignett. He is accompanied by Mr. A. J. Hazeland, Chairman of the Advisory Group, and by Mr. R. T. Adamson and Mr. A. E. Coll, Executive Directors.

I understand that Mr. Hignett will follow well established precedence and will give us first an opening statement which will be followed by our usual discussion period.

Mr. H. W. Hignett, President, Central Mortgage and Housing Corporation: Thank you, Mr. Chairman. Mr. Chairman and honourable senators, I am honoured to be invited to appear here today and I am consoled by the fact that sitting immediately in front of me is a former eminent director of Central Mortgage and Housing Corporation, who has recently undertaken some new tasks.

The Chairman: He has been elevated.

Mr. Hignett: Yes, indeed. If I may, I would like to add some remarks to the material we have already sent to the committee. I would like to review in a general way what has been done and comment briefly on the possibilities and needs of the moment.

If I may break in here, Mr. Adamson, who is an Executive Director of the Corporation and a member of the advisory group, has just joined us.

There are two acts under which we operate in the area in which you have an interest. These are Part V, sections 31-33 of the National Housing Act 1954 and section 26 of the Central Mortgage and Housing Corporation Act.

The NHA when introduced in 1944 recognized that investigation, information and development were a necessary part of a housing act. The preamble of Part V section 31 of the act makes this clear and states:

It is the responsibility of the Corporation to cause investigations to be made into housing conditions and the adequacy of existing housing accommodation in Canada or in any part of Canada and to cause steps to be taken for the distribution of information leading to the construction or provision of more adequate and improved housing accommodation and the understanding and adoption of community plans in Canada.

Sections 32 and 33 of the act set out a wide range of research, information and developmental activities for which funds can be used. It can be said that in one way or another some action has taken place along this wide front and perhaps somewhat beyond even what was contemplated originally. We have, in our brief to the committee, reported those activities which were relevant to your questionnaire. They form a relatively small proportion of assistance under Part V of the act. I think it useful if I describe to you the support given under Part V in a rather wider field of endeavour. This includes assistance for advanced educational training and study, institutional support, and the distribution of information. Some of these activities may be classified as art rather than science but many of them involve some scientific procedures and some scientific personnel. I hasten to add that within the whole universe of concern for the building of cities and housing what might be done is so great and what can be done has been and still is limited to a degree by the resources of skilled people.

Honourable senators, you have a catalogue of all of the Part V grants which shows what has taken place. We delayed giving you this sooner as we had hoped to have copies in French for you. I am sorry our Translation Department has not been able to complete the work for this. It might be of interest to tell you of some points of special concentration of the work done. These are in four main categories.

In Community Planning special efforts were first made in improving subdivision layout. This was fol-

lowed by strengthening and developing planning schools to meet the storage of qualified planners. As urban problems increased emphasis was placed on developing skilled people to work in this field. Since 1966 there has been introduced a large fellowship program. This program offers support for full time graduate study leading to masters and doctoral degrees within a broad group of fields related to housing and urban affairs. It is here we are trying to fill a gap in human resources. In Housing Design, although the single family house (the small house designs scheme) has received most attention, there have been special steps taken to widen the vocabulary of housing, particularly in multi-family vertical and horizontal housing. Also there have been endeavours to encourage improvement of existing dwellings or residential areas by rehabilitation. It is here we are working with the design professions, the building industry and the public. In Building Technology there has been a particular attempt to solve the problems of waste disposal and a search for the use of new materials and innovations in construction by building experimental houses. Much of this is entirely within the scientific field. It is here we work closely with the Division of Building Research of the National Research Council and together have developed programs of technical research development and building. There is, however, a substantial area of assistance in this category to projects employing skills rather than scientific procedures.

In the general category of Housing and Urban Affairs a broad spectrum of problems has been looked at. It is here where we find programs and proposals that are more diverse and perhaps less central to the National Housing Act. This is one of the reasons for establishing and supporting the Canadian Council of Urban and Regional Research. It seems appropriate that another research organization should pick up the many problems in the wider field of urban and regional affairs.

What we have done has been due partly to the initiative of the Corporation and partly it has been in response to applications for financial aid.

The Corporation has also been instrumental in taking the initiative in the activities which can be described as institutional support. The CCURR which I have just mentioned is in this category. Under each of the four main categories, Community Planning, Housing Design, Building Technology and Housing and Urban Affairs, there has been developed some broad continuing framework within which people have been invited, encouraged and enabled to meet and join together to pursue the objectives of better housing, planning, building and urban growth. The Community Planning Association of Canada, The Canadian Housing Design Council, the Canadian Council on Urban and Regional Research and the relationships with the National House Builders Association and the

Division of Building Research of the National Research Council are all of this kind. Progress in these fields comes about from a continuing process of dialogue and communications and the consequent development of ideas, studies and action. Perhaps the most important use of Part V funds has been in building these institutional frameworks within which new ideas can be generated and new people come together to see problems and discover ways of advance. More recently universities have been encouraged to establish interdisciplinary groups and centres to focus on research and development in the areas of our interest.

It can be said, I think, that there has been a plan for developing a program of institutional support and training support. Beyond this there has not been a preconceived overall program plan. But special efforts have been made for finding and encouraging people to work on topics that interest them and have significance within the very wide range of our interests in housing and planning affairs. On the whole people's interests tend to converge upon matters of current public concern. For this reason the work that has been done under Part V funds has generally proved to be relevant and useful and entirely eccentric proposals have been rare.

The work done and being done, while rapidly expanding, is modest in relation to the vast scale of money and manpower being invested in Canadian urban growth. Nevertheless, it represents a considerable body of work on a wide range of subjects, carried out by a large number of people in all parts of the country, in discussion, in thinking, in writing, in experiment and study, in teaching and learning, in publications, books and reports. Furthermore, it represents the beginning of a new period in Canada, in laying the foundation for public understanding and study of housing and urban affairs. There now are far more people to work in these fields and more opportunities to give direction and purpose to what they do.

Perhaps some figures will give an indication of the increasing level of activity. In the nine years from 1946 to 1954 expenditures of Part V funds outside the Corporation amounted to about \$1 million.

From 1955 to date (December 31, 1968) approvals for extramural projects have been almost \$10 million. As a further indication of the acceleration in the last few years approvals have been \$.7 million in 1965; \$1.3 million in 1966; \$1.5 million in 1967 and \$2.4 million in 1968.

This means that over the last four years of the 1955-68 period, not only has there been a significant increment from year to year in the programs but something better than 60 per cent of the approvals occurred during the last four years.

In detail approvals from 1955 to date are: Institutional Support nearly \$3 million; Training and Education more than \$3 million; Research and

Development more than \$3-3/4 million; and Special grants nearly \$400,000.

The foregoing figures also disclose that about 42 per cent of all funds have been made for institutional support; 31 per cent for training and education (including conferences and exhibitions) and the remaining 27 per cent for the support of research and development. These percentages show, to a degree, what has been a policy—the emphasis on establishing and continuing support to institutions which draw together numbers of people who interest themselves in housing and urban matters; also an emphasis on training people to develop special skills in the field of housing and urban affairs. These two programs are now costing more than \$1 million a year and they should continue to be supported by funds from Part V of the National Housing Act.

A new development has been the emergence of interdisciplinary groups in centres of research at some of the universities (Montreal, Toronto, Waterloo and Manitoba). These centres are receiving support and encouragement from Central Mortgage and Housing Corporation. It is expected that there will be an increase in this kind of organization at a number of universities. Before funds are given, the Corporation makes sure that the university authorities fully support the structure and aims of the centre and are willing themselves to carry their part in the financing of it.

It has only been comparatively recently that a closer relationship has developed with other government departments doing research relating to areas of interest to Central Mortgage and Housing Corporation. For many years there has been a close relationship with the Division of Building Research of the National Research Council. There is now increasing consultation with such departments as Transport, Manpower and Immigration, Department of Industry, National Health and Welfare, Energy, Mines and Resources, and Indian Affairs and Northern Development. We share the support of research projects with some of these departments. There is also a liaison with the Canada Council and there are shared projects with that organization. These are all attempts to complement and integrate with the research activities of other federal government departments who have mutual interests with Central Mortgage and Housing Corporation.

The research prospects for housing and urban affairs have improved considerably over the last few years. The time is coming when a more directed and carefully integrated program can be developed to take advantage of skills, interests and resources and to direct these to the needs of the moment. As a first step in this direction an inventory of work done here and in other countries is needed. This is a large task.

A further step being considered is to identify priority subjects for research. These may be blocked out in

large subject areas such as—new cities—pollution—new forms of housing—urban transportation—conservation and rehabilitation, et cetera. In fact, many of the proposals coming forward fall within these areas as they are naturally the current subjects of interest. While they do have importance, they are accidental and there still exists a need to separate out the most significant micro problems for research within the large subject areas. On the large subject of pollution of water (I think Dr. Solandt told you there were 228 committees dealing with the water problem) we would consider the development of a self-contained non-discharging system of sewage an important area to research. Within the large area of new forms of housing a study directed towards solutions to high density and high rise housing with special regard for family living and multiple use building would be valuable.

There is now an opportunity to develop a more selective and structured program of research, experiment and development in the fields of housing and urban growth.

In closing I would like to say that government has two roles in research. First, it needs to do and sponsor research focusing primarily on public policy. Research is required for the intelligent formulation of policy and for monitoring the impact of policy on people's lives.

Second, the private incentives to conduct research are not commensurate with the overall benefits, it can bring. Research, in general, requires a patron, either in the form of private foundation or public funds. Governments in general, including the federal government, have a strong justification in the public interest to generate research activities beyond those activities which stem directly out of policy considerations.

Thank you.

The Chairman: Thank you very much, Mr. Hignett. You already at the beginning of your remarks recognized the member of the committee who is a former collaborator of yours and who has been designated today to initiate the discussion, Senator Giguere.

Senator Giguere: Mr. Chairman, I am very pleased to have this opportunity of meeting Mr. Hignett and the officials of CMHC again. I have been associated with CMHC as a director and member of the executive committee for five years. During that period I have learned much, but I still have a lot to learn, so if the Chairman will allow me, I would like to start the ball rolling by asking Mr. Hignett a few questions.

Does Part V of the Act set limitations on the total amount of funds the Corporation can devote to research?

Mr. Hignett: Yes; this is done in two ways. Part V of the National Housing Act has a statutory provision for \$10 million for research operations.

The Chairman: Is that \$10 million annually?

Mr. Hignett: No, it is a statutory allocation of \$10 million, and it has been customary for the Corporation in each year to seek in the minister's estimates the reimbursement of funds that have been used under Part B for research purposes.

So theoretically at the beginning of each year the fund is restored to \$10 million. Theoretically as well it would be possible to spend \$10 million in a 12-month period, but this kind of expenditure by CMHC is not a capital expenditure, it is a budgetary expenditure and so is subject to the scrutiny of the Treasury Board.

I must say that the Treasury Board have been kind to Central Mortgage and Housing Corporation; I can think of no occasion when there has been any inhibitions on the part of the Treasury Board in allowing the Corporation to generate such programs as it wished to generate in any 12-month period, so they have been generous to us in that respect.

The Chairman: You should not admit that in public.

Mr. Hignett: At the moment, as the senators have perhaps learned, there is some restraint on research funds, particularly the growth in research expenditures and we have been asked, not to stop growth in research expenditures, but to exercise some control over the rate of growth.

Senator Giguere: And the control is exercised by the advisory group and the Board of Directors?

Mr. Hignett: That is right.

Senator Giguere: Who are the advisers on the advisory group, apart from those representing the board? What is their background? We know there are seven of them, but who are they?

Mr. Hignett: I can name them for you, but since Mr. Hazeland is the chairman of the advisory group I think it would be a good thing if he dealt with that question.

M. A. J. Hazeland, Chairman of the Advisory Group, Central Mortgage and Housing Corporation: We have two Executive Directors, Mr. Adamson an economist and Mr. Coll with legal training, who are both here; Mr. Gitterman, an architect-planner, who works in the technical field; Mr. Knight, an economist, who is Director of our Economic Division; and in the field of planning Mr. John Fowlie who is an architect-planner. I am an architect and cover the housing design area. We also have Monsieur Nantel, a planner with legal training, who at the moment is seconded to our Quebec region to work with the government of Quebec on housing matters. He attends all our regular meeting.

We have as a consultant Dean G. Carrothers, who was recently with us as an adviser, and who now is Dean of the Faculty of Environmental Studies, York University. He attends our meetings and gives us valuable advice and help.

Senator Giguere: How are they appointed?

Mr. Hignett: They are appointed by the management of the Corporation; the advisory group is a rather special group of highly skilled men in the various fields of housing and urban development. They have no operational function in the sense that they are engaged in the day-to-day operations of the Corporation; it is a group of seven or eight men who devote their time to looking at what the Corporation is doing and to looking at what is happening in Canada.

They have performed outstanding services in recommending to the Corporation's management from time to time and to its Board of Directors the direction in which legislation should be taken and what new legislation would be helpful.

They also encourage institutions, universities and individuals to undertake research in areas of our interest. It is a group of people that one does not find in many business organizations, but a very useful one.

Senator Bourget: How often do they meet?

Mr. Hazeland: We have regular meetings every two weeks and we stagger these with our executive committee meetings.

Mr. R. T. Adamson, Executive Director, Central Mortgage and Housing Corporation: And irregular ones about every three days.

Mr. Hazeland: We meet almost continuously; in fact, we generally start every day with a short meeting.

Mr. Hignett: We have devoted ourselves, as I have mentioned, for a number of years in developing housing and urban skills in this country. I think one of the biggest problems we have had over the past has been the absolute shortage of men who are skilled in the planning field. If any of you are familiar with Canadian municipalities and, indeed, provincial governments you will know that a great deal of the planning for instance that has been done in Canada in the last 15 or 20 years has been done by people who have come from France and England.

We began by encouraging universities to develop schools of planning and we supported them very strongly with bursaries and scholarships. Then when most municipalities were really able to take care of the problem of community planning as such we widened our training program into the board field of urban affairs, involving many disciplines. Our fellowship

program has grown to the extent where this year it will be \$700,000 for 90 fellowships.

Mr. Hazeland: 75 fellowships in universities in Canada and 15 in universities outside Canada.

The Chairman: Would you have some kind of rough breakdown by disciplines or professions?

Mr. Hazeland: The professional fields it includes, are of a very wide range: urban and regional planning; urban, civic and landscaping design; housing and housing design; urban renewal; community facilities planning; urban engineering and urban transportation; law of planning and development; urban and regional administration and finance; urban real estate; finance and management; community organization and planning; urban environmental health, and other related subject areas.

Mr. Hignett: You do not happen to have last year's breakdown of who received them?

Mr. Hazeland: No, I have not.

Mr. Hignett: The 1969 fellowships for the year beginning in September will be selected in the next two months, but we can give you the breakdown of those who received fellowships last year. They range all the way from lawyers to sanitary engineers.

Senator Bourget: In the universities today are they taking more interest in your field of research?

Mr. Hignett: Indeed; there are now five planning schools in Canada. These are still not turning out enough planners, but there is a good supply of planners relative to the past. A new interest at the universities is the development of interdisciplinary groups and centres of urban study. These we're beginning to support and encourage.

Senator Bourget: Is this outside the architectural faculty?

Mr. Hignett: Yes, indeed.

Senator Bourget: Completely?

Mr. Hignett: Completely.

Senator Giguere: Apart from the scarcity of skilled people, you mention in your brief on page 6 that forces exerting limitations on your research program are space and financing.

The Chairman: Do you have a housing problem?

Senator Giguere: Physical limitation of space; is that because you lack space at the headquarters, or is it space in the universities? Page 6, that is (f).

Mr. Hignett: The staff of the Corporation has not grown in numbers in the last 15 years, but the composition of the staff has changed very substantially. The professional content of the staff is greater than it was 15 years ago and the clerical content is relatively smaller. Although we are no more in numbers it has created space problems for us that are very acute.

Senator Giguere: Now, what about the financial restrictions? If you have \$10 million to play with, how are you restricted? Is it by Treasury Board?

Mr. Hignett: Yes. I mentioned last year that we increased research activity from \$1.5 million to \$2.4 million. I expect that in 1969 we will be allowed to increase this by 10 per cent to 15 per cent, notwithstanding a general exhortation not to have these funds grow at a greater rate than 5 per cent.

So there are practical limits; I would think that if we were given \$3 million for this program in 1969 this would be regarded by the Treasury Board people as being quite generous.

The Chairman: But from your own point of view, judging the potential of research and the urgency of problems, do you feel that you would be able to spend more efficiently?

Mr. Hignett: Very much more; I mentioned the new centres that are being developed at four universities. While the universities are quite prepared to bear a substantial portion of the continuing costs of these interdisciplinary centres, they do require starter funds, and they do require as well continuing support and, indeed, they may require teaching support. These four universities are by no means the total potential; our problem is going to be in the selection of universities where work of this kind can best take place. I do not know how many have now been identified but there are certainly more than these four.

Mr. Adamson: Yes, I think almost all universities are potentially interested, but the ones to whom we have made substantial research grants now are, in fact, Manitoba, Montreal, Waterloo and Toronto. There have been ad hoc grants made at other institutions to people, but not program grants in the sense that they are made at these four institutions.

Mr. Hignett: This kind of program for support for urban centres in universities could very quickly develop into something that would require up to \$2 million per annum in itself.

Senator Giguere: For that alone?

Mr. Hignett: For that alone.

Senator Bourget: Coming back to my colleague's question about the limitations of space, when you

mentioned it, did you relate it to the research program you could do inside the Corporation, or is it because you have not enough space for powers and responsibilities that you could have?

Mr. Hignett: It relates directly to what we can do inside The Corporation. For instance, our economic division, which as an in-house research unit is very important to us. We just have to know about the demand for housing over the next 15 to 20 years. We have to know about the demographic needs as they relate to housing needs; we have to know about the probable flow of capital funds into housing.

If I had to hire tomorrow morning another fully qualified economist, we have literally nowhere to put him.

The Chairman: Do not send him to the Senate.

Senator Giguere: We have the same problem.

Senator Bourget: How do you establish priorities about research, generating projects of research with universities or with institutions? How do you establish your priorities?

Mr. Hignett: First of all, the priorities of our in-house research relate entirely to the developing housing program in Canada and the research that we need to do to formulate policy in the form of both housing policy and legislation from year to year. This goes on and is continuous. We have felt the need to devote a large measure of other support to training people skilled in urban affairs in Canada and we have devoted, as you know, a substantial part of our effort to this.

In terms of outside research, up to the moment, we have tended to respond to demands made upon us; we have encouraged people to talk to us, but by and large we have left it to them to approach us and by and large we have left it to them to select the areas that they would like to research.

We think that perhaps we have now reached the stage where the skilled manpower resources of the country are such that much greater attention can be paid to directed research, to research areas in urban matters that we ourselves believe to be important.

Senator Bourget: On that particular point, when you give grants to universities, or some associations, are these programs for specific purposes or specific projects? Are the institutions or the universities free to undertake any kind of research, let us say technology or in some other spheres regarding housing?

Mr. Hignett: No. Until recently it was on a project-by-project basis. In discussing a research project with a person interested in conducting the work it has been necessary for us sometimes to reshape his project so that it fell more squarely within the realm in which

the National Housing Act gives us authority, or we have had to scale down the research grant to that portion of the project that we thought was related directly to housing.

Generally speaking, it has been very much on this project-by-project basis. However, the field that we are now entering, the development and support of centres of urban studies at universities, has elements of both kinds of research grants. Funds for developing the most appropriate centres of study and funds for work done at these centres on a project-by-project basis.

Senator Bourget: How do you make sure then that there is no duplication in the research projects that are going on? Have you got information for you to be sure that there is no duplication in research work being done by universities or the provinces or municipalities? Have you got a centre where there is somebody, either the advisory group or some other organization in your Corporation, that would look into it so that there are no moneys spent for nothing, let me say it like this?

Mr. Hignett: There have been some rather modest steps taken in this direction. For example, the Canadian Council of Urban and Regional Research, as one of its first tasks developed a catalogue of all of the urban and regional research that had been carried out in Canada and beyond Canada to the extent that the work related to Canada. This catalogue I think for Canada is fairly complete, but on a wider basis it is not.

I think mention was made in my opening remarks of the need for further development of an organization that was aware of what was going on both in North America and the rest of the world in research in housing and urban affairs. I mentioned the Canadian Council of Urban and Regional Research because it is an organization that is perhaps regarded much more highly outside of this country than in it; it has a world-wide reputation. It is one of the first of its kind and perhaps you know was supported strongly by the Ford Foundation and was considered to be so successful that Ford have granted funds now for the creation of similar organizations in the UK and in the United States.

Mr. Adamson and I serve on the United Nations Committee on Housing, Building and Planning; they are aware of the Canadian institution in this field. They too are aware of the need for developing a single centre for the exchange of urban information and there is a proposal, if it can ever be financed, that there be a world institution of this type set up in New Delhi, in India.

So there are prospects for sharpening up the information service in this field, but not all research is public. There is research carried out by the federal government in Canada, by the ten provincial governments

and, indeed, by municipalities, that is regarded as confidential research. A year ago ten provincial governments and the federal government at the official level and as a result of the Federal-Provincial Conference on Housing and Urban Development agreed to set up an interprovincial, interdepartmental committee of information on urban research where all of the research on a confidential basis being carried out by municipalities, by the federal government, by provincial governments, would be not only freely exchanged so that duplication did not occur more than necessary.

Senator Bourget: How long has it been set up?

Mr. Hignett: Last September.

Mr. Adamson: Formally it was set up last September; the structure was set up last september, but I believe it just hired a man quite recently.

Senator Bourget: Are all the provinces interested in being represented?

Mr. Hignett: Yes.

Senator Giguere: The federal government is paying for it.

Mr. Hignett: Although the federal government is paying for it, one of the provinces has suggested, and quite rightly, that they do not want the federal government to pay for all of it.

Senator Haig: That is a switch.

The Chairman: They want to get more tax revenue from the provinces in order to make their contribution to this interdepartmental committee.

Mr. Hignett: So although the federal government is paying the cost of setting up the secretariat it has been made plain to us that this is not a federal institution, that it is very much a joint federal-provincial venture and they propose to not only play their full part in it, but pay part of the costs. I think they feared that if the costs were borne entirely by the federal government it would look too much like a federal institution.

Senator Giguere: Does the research by private industry or the labour unions amount to much in Canada?

Mr. Hignett: The research by private industry, of course, is consumer oriented. There is a lot of research goes into new materials and new equipment, the use of new materials, the use of old materials in new ways, but the type of research they do tends to be the type of research that has a quick pay-off and in terms of the problem it is really very small.

Senator Bourget: So there are very few private organizations who are interested in researching housing?

Mr. Hignett: The National House Builders Association, for example, has a research committee. The National House Builders Association is made up of members who generally are the people who build housing in Canada. The total housing program is of the order of \$3 billion a year, and the input by the National House Builders Association would be perhaps \$30,000 and CMHC puts in another \$30,000 to match it.

Senator Bourget: That is very little when you consider the amount of money that is spent in housing.

Mr. Hignett: But it is being done in highly experimental work. It has been done in new forms of construction that are considered by them and by us to provide safe shelter but that does not meet the requirements of any building code in Canada.

Senator Bourget: The only research they will probably do will be to find new methods of construction; that will be it, I suppose, and for the rest they rely mostly either on the CMHC or National Research or the researches that are made in the universities; would that be it?

Mr. Hignett: Yes.

Mr. Adamson: I think the supplying industries to the construction industry, of course, must do an enormous amount of product development research, because as we all know the components that go into the building of a house today are very much different from what they were 30 years ago. I think many of these changes rest upon research and development work done by industry, but which does not appear explicitly in their accounts as such; it is product development work.

I do not know how to get good figures on that, but when one looks at the transformation that takes place in the equipment and materials that go into a house today, we know a great deal of work is done by industry in this field.

The Chairman: It may have been done in the United States though.

Mr. Adamson: It may have been done in any part of the world.

Senator Bourget: Surely when we are spending billions of dollars for the benefit of this association somebody should talk to them and say you should put a little more money into this; when a billion dollars is spent and they are only putting in \$30,000 for research, this is very, very little.

Senator Carter: In the CMHC do you have a priority list of projects of your own? I kind of gather that you work both ways: universities have students who are interested and they contact you and if that fits into your program you start with the project in the university, but is there any planning, do you have a list of priorities and then go shopping around to where you can get these projects carried out?

Mr. Adamson: I would think the answer to that is no, we do not. That is an area which I think is one of the most promising lines of development, the mere fact that we do not have space in our own building to house researchers that might help us with particularly important research problems does not really prevent us from farming out projects that are more or less designed; we have not done that I think nearly to the degree that we could.

The Chairman: To what extent have you done this up to now, since last year? Do you have any specific figures about this, about contractual work?

Mr. Adamson: I suppose you could call the Ontario Research Foundation proposal on water & sewerage that we talked about this morning, as a farm-out project which states specific questions and invites people to go to work on them.

Mr. Hignett: It has seemed to us for a very long time that the provision of water and the disposal of sewage is still being done the way the Romans did it. It seemed to us that there must be better ways of dealing with this most important problem.

It is a fact that the sewage treatment system of an urban area and its pipes more than any other thing determine the shape of the city and the kind of city that it is. We have been encouraging and directing research in this area for quite a long time.

We have patented a system of an individual sewage disposal system for a single house where, theoretically at least, you fill the tanks with water, then you need no more water and there is no discharge from the building except by evaporation.

We are just now embarking on a similar project with the Ontario Research Foundation on a similar system for very large buildings. We know enough about this subject now to know that it should be possible to have completely enclosed systems of water supply and disposal in buildings of very large size. We are just beginning this exercise.

Senator Carter: In urban areas, or just for rural areas?

Mr. Hignett: Urban areas: If we could release ourselves from the umbilical cord of sewers, we could do a lot for urban development that is not possible now.

Senator Carter: That is why I ask about the priority; in my simple mind I see a Crown corporation to which a large sum of public money is allocated to try and solve housing problems and one of the main factors in that problem is housing costs. I just wondered if you had a priority where we will concentrate on some research to get around the cost of housing, or do you think that should be not in your realm, but in the realm of the builder?

Mr. Hignett: I think it is quite properly in our realm. There are three costs to housing: there is the cost of the land on which the housing is built, which is perhaps the one thing in Canada that has got more out of hand than any other; there is the cost of money, and some people think that is getting out of hand as well; then the cost of the structure itself.

Senator Giguere: And labour.

Mr. Hignett: And the cost of labour going into the structure. The materials and labour determine the cost of the structure.

In this third one, the cost of actually building, the increase in cost has been at a much slower rate than either the cost of land or the cost of money. This is an area in which a great deal has been done in modest ways to decrease construction costs. The area of possible reduction in costs is much smaller than you might think. If you could find ways of building the shell of a house in such a way that you save 50 per cent of the material costs involved, you are dealing in 2 per cent or 3 per cent of the cost of the structure.

Senator Giguere: Is that right, that the shell is about 5 per cent of the total cost?

Senator Carter: What per cent would the labour be?

Mr. Hignett: About twenty five per cent.

Senator Robichaud: That does not include labour on material and equipment.

Mr. Adamson: No, if you push that back it is all labour.

The Chairman: In your brief on page 9, trying to follow up these questions, you say that you have now 29 professional people on your staff.

Mr. Hignett: These are professional people I think who can properly be described as being in research.

The Chairman: Yes, that is what I mean.

Mr. Hignett: We have many more professionals than that.

The Chairman: Yes; who are performing administrative duties.

Mr. Hignett: That is right.

The Chairman: But you have 29 people on your staff doing research?

Mr. Hignett: That is right.

The Chairman: How many of those would come, for instance, from the social science disciplines?

Mr. Adamson: The bulk of them.

The Chairman: From looking at this I would say about 20 then come from the social sciences?

Mr. Adamson: Yes.

The Chairman: And nine from the architects, engineers, and so on?

Mr. Adamson: Yes.

The Chairman: When I see that there is no space available for more I am a little bit worried.

But how can you explain on the same page the rapid increase in 1968, the turnover of 48?

Mr. Hignett: That is one that bothers me; we have found economists in strong demand. We have had a department of economic research for 20 years and a very good one, but in the last two or three years all departments of the federal government have been creating economic units and we are fair game. It happens that we are just not able to match the advantages being offered by departments of the federal government and we are losing our economists to the federal government.

The Chairman: Why is that? You are free to set up your own salary structure.

Mr. Hignett: Within limits.

The Chairman: Do not tell me that the departments which are much more closely scrutinized by Treasury Board can offer higher salaries than you can?

Mr. Hignett: Yes, they can.

The Chairman: Why?

Senator Robichaud: Those economists that you are losing, in what range of salary are they?

Mr. Hignett: They would be paid by us on an average of \$10,000, to \$15,000.

And are going to federal departments at perhaps \$18,000 to \$20,000.

Senator Bourget: With how many years of experience at that range of salary?

Mr. Hignett: We have not lost people at that range of salary; we have generally not lost many people who have been long term employees. We have lost one or two, but we have lost a great many that have been with us for three or four years and, of course, we have invested a lot of money in these people. Perhaps we have reacted a little too slowly.

Mr. Chairman, you did say that the Corporation can, if it wants to, deal with this situation. This is something that we have had to do and I do not think that our turnover in economists in the next 12 months will be as great, but nevertheless we have to always consider the relationship between our economists, engineers, architects, lawyers. If one gets out of line too far, the others notice it very quickly, so that this is a problem of all professionals, not just the economists.

Senator Bourget: Let me give you an example: if you had an engineer, for instance, who had five years' experience and an economist with five years' experience, what will be their salary?

Mr. Hignett: We would tend to pay them the same, or very close to it; that is not the way the market is working.

The Chairman: And yet we have a surplus of engineers.

Mr. Hignett: That is not the way the market is working, but when you get a situation like ours that is full of professionals, this is the way it works.

Senator Bourget: When you take a young man just graduating from university as an economist, how much would you offer him as initial salary?

Mr. Hignett: \$7,500; is that right, Mr. Adamson?

Mr. Adamson: You could not get a doctor, but a person with a master or bachelor degree.

Senator Bourget: Would you offer him \$7,000 or \$8,000; would that be in that range?

Mr. Hignett: Yes.

Senator Bourget: I think it is normal in the market today for a young man who comes out of university a bachelor to get \$7,000 or \$8,000; am I right in saying that?

Mr. Hignett: That is right, but the demand for economists is generally with some experience and with a

higher degree of education than a bachelor degree. The way the federal service deals with them, although they have salary ranges that are fairly tight, they have some fairly wide discretion as to what category or classification they put them in; it is this reclassification that affects us.

Senator Bourget: Exactly, that is the problem I think, because they get a good salary when they enter the service, but after five or six years they say well, there is no advancement for us. That is the reason, probably there are others also, but I think that is one of the main reasons, because they say we have no future in there, we are just limited by what you said before.

Mr. Hignett: Yes, and it has been necessary for us in the last six weeks to review the salary ranges of all our economists.

The Chairman: With this very limited number of people, let us say 20 economists, I am sure that your intramural research program must be very limited to your almost day-to-day problems.

Mr. Hignett: Exactly.

The Chairman: On the other hand, you have another program with the universities where you have no direction at all, or no influence; they choose, or they pick up their own fields of research which, of course, may be useful, but to come back to Senator Bourget's and Senator Carter's question, there is it seems to me a tremendous gap there between the two, where we would need at this time, when we hear that there is a housing crisis, to fill that gap very quickly.

I do not see how it can be filled very quickly if Central Mortgage does not come in and try to fill it up.

Senator Bourget: That is it and particularly in the circumstances.

Mr. Hignett: That has been more in the field of sociology, has it not?

Mr. Adamson: It has been in every field.

The Chairman: Yes, in sociology.

Mr. Adamson: But I think you are quite right, Senator; there has been an opportunity to direct more of it to our own policy requirements and needs. In view of the growth and the scale of the extramural research in relation to our own intramural research I think, as I said to Senator Carter, this is an opportunity that we have not exploited sufficiently in the past and will be able to explore more effectively.

Senator Carter: I was fascinated about that story you told us about the water supply and disposal; is that a product of your own research and have you got any more results like that you can show us for the money you have spent?

Mr. Hignett: It was research that was in every sense directed; we discovered years ago that not only was very little known about this subject, but little work had been done in it.

The Chairman: Was it done by yourself, by the Corporation, or by NRC?

Mr. Hignett: No, it was done by the Ontario Research Foundation, but it was done in very close cooperation with us. One of our advisers, Mr. Gitterman, had spent much of his time working on the idea. It has great possibilities; we have, for example, a school up in Dorset in the far north.

The Chairman: That is better than working in sewers.

Mr. Hignett: That is right; that has had this system operating now for how many years?

Mr. Hazeland: About six years; it is a closed system and they have to replace some water about once a year, a little bit of water. They reuse the bulk of it. The water is not pure looking, it is discoloured, but that is only oxidization. For the north this closed reuse system is very valuable.

Mr. Hignett: It is not quite so unattractive as it sounds; Mr. Adamson and I were in England two summers ago and we were told by the London authorities that by the time the Thames River reaches London Bridge every cubic foot of it has been used eight times.

Senator Grosart: May I direct your attention to page 16 of your report. In the second paragraph you say the Corporation has not established a fixed system of monitoring. Then, in the next paragraph you say you have not used the critical path network or a program of evaluating review techniques.

Do you have any kind of continuing technical audit of these projects?

Mr. Hazeland: On all our university projects we have an agreement with the university; this is a legal agreement where we arrange how the payments are to be made, the reports that are to come forward, the interim reports and the final report. We generally have a date attached to these. I may say it does not always work out that way, but we do have it tied up quite tighter. Our payments are not made to the researchers; they are always made to the university and they disburse it to the department concerned, or the individual concerned.

We do monitor, in the sense that we do receive and revise reports; we do have meetings with people as they go along with their work and we do invariably, in our agreement, say we will review the research work at its completion and decide whether it is worth publishing. This we do as a separate operation.

Senator Grosart: Do you do any kind of cost benefit analysis?

Mr. Hazeland: No, we do not, not in a precise way. We use a judgment and assessment technique as we go along.

Senator Grosart: I am rather suprised that you say that this kind of thing is impracticable because of the large scale of your extramural activities. This would seem to me to be a place where it is most necessary when your projects are widely scattered. This would seem to be the place where you would need some kind of technical audit.

The Chairman: I suppose that the university professors and the academic community would find this an unbearable interference?

Senator Grosart: There are several departments that insist on it; they may find it unbearable, but so long as they are getting the money there are some burdens that they have to bear. But the way, I should perhaps say, Mr. Chairman, that Mr. Hazeland and I have something in common, in that 45 years ago we sat together in school in a place called Chefoo, North China.

I notice what almost seems to me to be a contradiction to an impression that I have received about the extent of your research in the concluding pages of the statement you made where you seem to make the point that there is a tremendous amount of research needed in this area. You stress also that most of the funding appears to have to come from government.

I wonder is there anything being done in Canada to require industry, particularly developers, to provide the necessary research for the political bodies to make good decisions about plants? It is done in some countries; are we doing it here?

Let me make that clear: Do we say to developers, before we look at your plant we want the following research information as the basis of our decision. Are we doing that in Canada?

Mr. Hignett: I do not think so. First of all, using the term developer I assume that you mean a man who builds a piece of a city, who assembles land, subdivides land, builds housing, commerce or industry on it?

Senator Grosart: I used it in the generic sense, to take in the entrepreneur, not the single, small builder, but my point here is that here is a very profitable industry and I am wondering if it is bearing its proper

cost of the research necessary to make the kind of social decisions that must be made about urbanization?

Mr. Hignett: No, I would think not. To begin with, Central Mortgage and Housing Corporation is removed many times from this person or these persons. The decisions about the development of any urban community are by and large local decisions that we find that we cannot only not change, but exercise very little influence over. Then, of course, the municipalities are themselves responsible to the provinces.

The development of cities is done mainly in a negative way, rather than in a positive way. It is done in a series of thou shalt nots, rather than thou shalt.

The Chairman: And we get the cities by accident.

Mr. Hignett: That is right.

The Chairman: The way we get a science policy by accident.

Senator Grosart: This, I think, is the social complaint that we hear very often and I was not asking you whether Central Housing and Mortgage was exercising responsibility in this area; I was asking is it being done and would got a step farther and ask if not, why not?

These people can afford to do this; why should it not be public policy to insist that they do it?

Mr. Hignett: I would think that perhaps the most urgent problem facing urban Canada is the fact that in most of the ten provinces urban communities are governed by municipal acts that are a hundred years old. The municipal acts of this country are related to another age and not to the present age. Perhaps the greatest need in urban Canada is for a complete restructuring of the municipal organization. The urban place is now not a municipality; it is a conglomeration of municipalities and is going beyond this into an agglomeration of cities.

The congregation of municipalities are giving way to the urban region. There is at the moment no structure that will permit the planning of an urban region as a unit. It still is made up of a large number of municipalities, each with its own struggles for assessment, each with its own responsibilities for planning, and each with its own responsibilities for all municipal problems.

Senator Haig: Each with its own building codes, too.

Mr. Hignett: Each with its own building codes. What we need most in this country is a complete restructuring, particularly in the 40 or 50 larger places of the country, so that authority can be given to the people responsible for the urban region itself, rather than its

parts. If this could be achieved then I think it would be possible for such structures to demand more from the people working within the structure, but at the moment it would be difficult indeed for the city of Toronto to demand something of a developer that is not demanded in Etobicoke, or in North York, or in Scarborough, and so on and so on.

There has been some movement in this direction; the regional governments of Ontario and the regional government of the city of Winnipeg have started, but these are only beginnings. The regional government of Ottawa is brand new but none of the powers that are important to the Ottawa region have been given to the regional government; they have been retained by the municipalities.

So in this respect we may be worse off than we were before, not better off, and until we are brave enough to cloak our regional governments with the kind of authorities that they need, we will just not make the progress that has to be made in the next 20 years.

Senator Robichaud: Mr. Chairman, most of the questions I had in mind have been asked by Senator Carter and have been answered, but if I may proceed on the same subject, first I would like to know, or can we be told what percentage of CMHC funds are being directed to urban areas, as opposed to rural regions?

Mr. Hignett: The National Housing Act generally relies on private enterprise. Houses are built by private persons who are building either for themselves or for landlords or for profit. The flow of capital into housing is largely from the lending institutions of Canada. This has developed a certain pattern; the big developers are in the big cities; of course, that is where the action is as well, that is where the growth is. The rural growth in Canada is very, very small, if any.

All of the investment opportunities that the lending institutions require can be found in the 40 largest cities of Canada; they do not need to go into rural Canada.

So there is gradually emerging a tacit agreement that if private enterprise will take care of the Canadian cities in the ordinary provision of housing for home ownership and for rental purposes, that we will devote ourselves to rural Canada. It costs a lot more money to operate in rural Canada than it does in a big city.

The Chairman: You mean on a per capita basis?

Mr. Hignett: On a per capita basis, on a per operation basis or per house basis.

So our mandate has been generally that now all Canadians are entitled to assistance under the National Housing Act so you must take care of the residual area which by and large has been rural Canada.

This is not true of such things as public housing and students' housing, sewage loans and housing for the

old; these tend to be in the big cities and, of course, we have devoted a lot of attention to this as well.

Senator Robichaud: But in the last two years has there not been a trend in small communities to get involved in this type of building?

Mr. Hignett: Oh, yes. These are direct loans wherever they occur. Housing development by non-profit corporations for elderly persons is not financed by the financial institutions of Canada; they are financed by the federal government at preferred interest rates and with very long repayment periods.

There is a tendency for these to show up in the smaller towns; there seems to be a desire among the provinces to encourage the old folk of the community to stay where they are and not to go to the big city, or to Vancouver, as they get old. Some provinces, like Quebec, New Brunswick, Saskatchewan, have spent a lot of money building elderly persons' accommodations in small places in the provinces.

Senator Robichaud: More so in recent years?

Mr. Hignett: Yes; in Quebec it has been going on for 15 years.

Senator Bourget: Is it through limited dividend?

Mr. Hignett: It is an arrangement very similar to the limited dividend, except that it is entirely non-profit.

Senator Robichaud: In rural areas now the CMHC is dealing with a class of borrowers with limited wages, limited income. How much research is being done in order to provide those borrowers of this class of people with low cost housing, because the main objection as we hear it is that the homes are too expensive. Even if they have to meet the standards which are established they feel that it is too costly; what research is being done in that field in order to provide a home at acceptable cost to this type of borrower?

Mr. Hignett: In terms of research, not a great deal, but in terms of techniques, quite a lot.

First of all, I think it should be said that the standards of the National Housing Act which are those of the building codes are not inhibiting features here. The standards of the National Housing Act are mainly standards of safety and a very modest house indeed can be built that will meet these standards. One should not relate the standards to what is being built in Ottawa, because these are very much above the minimum requirement.

Some provinces, like Nova Scotia for example, through Saint Francis Xavier and the Nova Scotia Housing Commission have encouraged housing co-operatives and the housing cooperatives in Nova Scotia are very active. As you know, Senator Giguere, they have for many years been building houses at a cost which sometimes makes us scratch our heads, a cost of \$7,000 to \$9,000.

Senator Robichaud: It can be done; I tried it, I have done it myself, that is why I asked the question.

Mr. Hignett: We have let individual people try all sorts of experiments; build a house that is finished on the outside so that the weather does not beat it to pieces, but on the inside it is simply insulated and is one large room, then develop it from there.

Senator Robichaud: You can do much better than that with \$7,000 or \$9,000, because I tried it and have personal experience.

The Chairman: I am sure that Senator Robichaud, knowing his family, would not be satisfied with only one room.

Senator Bourget: There is one supplementary question connected with it: What has been your experience with prefabricated housing? Would that be a way to lower the cost?

Mr. Hignett: No. Our experience with prefabricated housing is that generally speaking, at least as it is practised in North America, it produces good housing but there is no saving in cost, none at all.

Senator Bourget: Because I have here *Housing Construction*, which is published by New York architects, saying that prefabricating housing has doubled since 1960.

Mr. Hignett: Generally speaking, the prefabricated house, such as the Alcan prefab, for example, is a quality product as it is built under controlled conditions and it is a high quality product.

The Chairman: And it is not cheap.

Mr. Hignett: It is a product that can be delivered and erected very quickly, but the real assurance you get from that product is its uniformity; it is a uniform product, but it is not cheap.

Senator Bourget: It is not cheap even in the United States?

Mr. Hignett: No.

Senator Haig: What is the advantage of it then?

Mr. Hignett: The advantage of it is that it is a 12-month operation in the sense that it all takes place indoors, it takes place in large factories and it can operate 12 months a year. There are some savings for the prefabricator in his supply of materials by the quantity buying.

The Chairman: And the cost of labour, surely?

Mr. Hignett: The cost of labour tends to be lower, but the cost of delivery tends to be very high; the cost of delivery of the Alcan house runs about \$3 a mile.

Senator Bourget: And you say there has been no saving in prefabrication.

Mr. Hignett: Not that we have been able to discern yet and there is not much possibility of saving.

Senator Giguere: Are our existing building codes a restraint to technological advance in the industry?

Mr. Hignett: Yes.

Senator Giguere: They are; what is the future of this? Is there a hope some day of having a uniform building code?

Mr. Hignett: Yes, I think perhaps the one area that is being subjected to very close scrutiny by all provincial governments and by most municipalities is the need to adopt the National Building Code in its entirety, without change.

There are many people who pay lip service to the National Building Code and say that it is the code adopted for, say, the city of Toronto, and when you examine the code it has been changed and has included in it a number of things that are thought to be peculiar to the city of Toronto. I am just using this as an example. Of course uniformity of codes is absolutely necessary for industrialized building; it is necessary for prefabrication; it is necessary for developing a uniformity of materials and techniques. For instance, the field of modular co-ordination depends to a degree on the uniformity of building codes.

I think this is one area where encouraging progress is being made. I would expect that when the 1970 code is published, which is the next edition of the National Building Code, that it will be very widely accepted. For instance, some provinces like Ontario will probably require all of their municipalities to adopt this code.

Senator Bourget: Is there much difference between the building code of, let us say, Toronto and Montreal?

Mr. Hignett: I am not aware of the differences, but I do know that up until six months ago there were very substantial differences in the building codes of Toronto, North York, Scarborough and Etobicoke and a builder building in all three of the outer communities had to build three different houses.

The Chairman: If it goes on like this we will need a different building code in Montreal to be more adequately protected against bombings.

Mr. Hignett: There are many communities where the Alcan house, for example, which is a very fine house, is not acceptable.

Senator Bourget: Coming back to research now, how does your program of research compare to the one let us say in the United States? Are they doing more research in the United States than you are doing here in Canada?

Mr. Hignett: Oh, very much more, but this again is a recent development. It follows the creation of the Department of Housing and Urban Development which is about four years old and they have undertaken some very large programs, like their model city programs and their research into urban transportation. They not only are spending vastly increasing amounts on research, but on demonstration as well.

Senator Giguere: Do we have access to that research?

Mr. Hignett: Yes we do.

The Chairman: Most of it would be published.

Senator Bourget: Coming back to Senator Grosart's question and the previous question I asked also, is private industry putting funds into that too?

The Chairman: In the United States?

Senator Bourget: In the United States; are they contributing to research?

Mr. Hignett: I do not know, but I would doubt that in any important way they are.

Mr. Hazeland: I would like to add a footnote; perhaps it might help Senator Grosart. In general I think the entrepreneur is very quick to pick up and operate in a leading edge situation. I think it is true to say that this happens in the use of materials, in the use of components, in the use of techniques and the application of social ideas.

However, overriding all this, the entrepreneur has to see a cost benefit in it; innovation requiring a little risk he is prepared to take, because of competition. Competition works well up to that point, but to try and discern what research is there is very difficult. If you have a conversation with an entrepreneur he has what he calls his trade secrets and it is difficult to extract these but they can be seen in the end product. The competition is so fierce in this field that in fact in a curious way the entrepreneur is always trying to be in a lead position so as to be ahead of his competitor.

In that sense I think he does research. I do not know whether you would call it research, but he does take action and innovate to keep in front of his competitors.

Mr. Hignett: I think a close example is the development of Kanata here on the edge of the greenbelt which is a new kind of complete community development. It is being done by one man and is being done as a competitive operation. There are examples of this in the United States, the new towns of Reston and Columbia. These are sponsored by private entrepreneurs; some people like them and some people do not, but they are new, they are new in their housing forms, they are new in their layouts. This kind of thing goes on continually.

Senator Giguere: Also new in costs?

Mr. Hignett: There has been no break through in costs, no.

Senator Grosart: Of course, this would apply to any industry.

Mr. Hignett: That is right.

Senator Grosart: The innovation and the input of extramural innovation would apply to any industry. My question was directed towards their social obligations, because there are industries in which this is required. The drug industry, for example, is required to do its own research and bring the results into the controlling department for the very obvious reason that there is a social hazard here.

Now, there is just as great a social hazard in unplanned housing development. My suggestion is that it would make a lot of sense for some of the obligation for social research to be done. For example, in the Kanata situation why should not the municipality say to the developer, I am not sure whether this is the right kind of development in this municipality; here are the doubts in my mind, get me a study?

Mr. Hignett: They often ask for feasibility studies.

Senator Grosart: Feasibility is another thing. Presumably anybody who is any developer has done feasibility studies, but the social questions that arise from all of these urbanization problems, and particularly the housing aspect of it, are tremendous.

Mr. Hignett: For example, Senator Grosart, the financial institutions of Canada, the life insurance companies, the trust companies and the chartered banks, their investment in new housing would be over a billion dollars a year.

Mr. Adamson: I would say about \$2½ billion now.

Mr. Hignett: They tend to put this into the urban places and spend not a dime on what kind of housing it is and where it is going, what function it is performing and in what kind of community it rests.

Senator Grosart: That is my point and what I am wondering is why the decision they make, the people who have to decide yes or no, will we allow this, why they are not demanding this kind of study. There would be an immediate response from industry. Industry is quite prepared to accept the costs of doing business with various types of controls. I just do not understand why Central Housing and Mortgage Corporation, for example, should be required to do so much of this study for the benefit of the people who are profiting by it.

Mr. Hignett: Part of it is because of the fragmentation involved, the dispersion of operating in a large number of municipalities that often form our urban areas.

There are local debates going on and we are in the midst of one here now. What is the proper form of urban development for downtown Ottawa? The city of Ottawa has produced a report on the form of downtown Ottawa which it does not appear to like very much now it has got it, but it is an attempt to impose on the developer a social conscience of a kind, but again it is thou shalt not, you shall not have a building higher than 110 feet on Wellington and 325 feet on Gloucester. This kind of thing goes on.

Senator Haig: Mr. Hignett, what was your relationship to the task force on housing?

Mr. Hignett: None at all, senator. The task force on housing really was the first time in the 23 years since CMHC was created that there has been a review of housing and urban development in Canada by a group of Canadians completely at arm's length from CMHC.

The Chairman: Including the minister?

Mr. Hignett: Yes, including the minister; we welcome this. You may remember, senator, that what led to the National Housing Act in 1944 and the creation of Central Mortgage and Housing Corporation was a study that later became known as the Curtis Report. Many of the recommendations of the Curtis Report were adopted and found themselves in the National Housing Act and led to the creation of Central Mortgage and Housing Corporation.

In the 23 years since, more than half of all the housing that exists in Canada has been built; half of Canada's housing is less than 23 years old and it seemed to us at CMHC that when the government allowed the minister to go ahead with a study of this kind and select eminent Canadians to carry it out that it would be a good thing if it were done at arm's length of CMHC. They had the opportunity to question us and did so, but our only involvement in it really was in making the physical arrangements for it, in arranging for places where the task force would meet with the public and arranging for transportation locally, and this sort of thing, just so that it ran

smoothly, but as to its content, we had nothing to do with it; we had nothing to do with the preparation of the report.

Senator Robichaud: I would like to ask Mr. Hignett if he is aware of this talk that we hear about an experimental city?

It seems to me that even the minister at times has made reference to what he would call an experimental system or a new development altogether, new cities being created.

Has CMHC been involved in such planning or such discussion?

Mr. Hignett: We have watched with great interest the new towns' activity in the UK and there has not been a new town program in this country in that sense, although there have been many new towns built in Canada in which CMHC played a very large part, towns like Kitimat, like Elliot Lake, like Labrador City, towns that are generally associated with the opening up of resources on the frontier.

The recent discussion relates to not a satellite city, but a new city. This new city is not regarded as a satellite to any existing city, or even an adjunct to an existing urban area, but something entirely new and something that is capable entirely of its own support.

The discussion that is taking place seems to be a city of a million people. This is a pretty exciting proposal. We know that no matter what we do the population of Toronto is going to reach five million people by 1980 or 1985 and the same thing is true of Montreal. Nothing can stop Toronto from growing and nothing can stop Montreal from growing but some of the pressure might be taken off the existing urban places in Canada which mainly were created by accident if a new city were developed.

So if one expected to see a new city you would expect to find it somewhere in the St. Lawrence trench and I would think somewhere between Windsor and Quebec city if there was to be a first one. The idea itself is tremendously interesting. What we are presently trying to do is to reshape, for our present needs, cities that were laid down a hundred years ago for traffic conditions of a hundred years ago and for municipal requirements of a hundred years ago. The new city appears to give an opportunity to do all sorts of things that cannot be done in existing urban communities, new relationships between housing and industry, new relationships in the use of land, new relationships between urban transportation and the community, new ways of plugging the community into the system.

The idea is so exciting that I would regard it as being almost inevitable, but this is not to say that it will be conducted by Central Mortgage and Housing Corporation. The new city, to begin with, requires the acquisition of a very large tract of land; the new city will still

be in a province; my guess would be that what is required is some sort of an organization that contains all of the skills necessary to create a new city that is sponsored jointly by the province concerned and the federal government.

Now, that may be a very large joint Crown corporation on its own in which we may have a part to play in its growth, but perhaps not a part to play in the decisions that lead to it. This remains to be seen.

Senator Robichaud: Is this not on a smaller scale what is being planned or discussion has taken place regarding Belledune in New Brunswick where they have this mining development, east coast smelting, and others?

Mr. Hignett: Belledune is more of the order of Labrador City; it is an urban community required to service something that has emerged there.

The Chairman: You would not think of a new city of one million in New Brunswick at this stage.

Senator Robichaud: Not at this time, although it would be a great advantage.

Senator Grosart: Has any research been done on the ancillary costs of housing development as they would be reflected, say, in municipal taxes?

Let me put it another way: if a municipality having before it a request for a building permit, regardless of size, would say we want to know what the cost of this will be in terms of the mill rate?

Mr. Hignett: This is the way the game is played; this is why, for example, metropolitan Toronto is in the trouble that it is in. The break-even point on the municipal tax rolls in Toronto at the moment is a \$30,000 house and the boroughs of metropolitan Toronto do not welcome anything that costs less than \$30,000, or creates an assessment of less than the \$30,000.

This is why we find that in Scarborough you are not allowed to build a house of less than 1,200 square feet when it is known that three bedrooms can be put into 1,000 square feet without any trouble. This is why municipalities do not welcome public housing in their communities, because it is negative on their tax rolls and the whole objective at the moment by the municipalities of Canada is to create the kind of housing accommodation that breaks even on the tax rolls; this is one of our greatest problems.

Senator Grosart: I am aware of the discussions that have gone on, but what I am asking is what research has been done so that a municipality could estimate precisely the effect of any particular housing development on the tax roll?

Let me put it this way: Can somebody produce for them a piece of paper and say here is what it is going to cost in extra sewerage, here is what it is going to cost eventually in extra parking if the municipality has to provide it, here is what it is going to cost in police services, fire services, transportation?

Mr. Hignett: I think the municipalities are pretty sophisticated in this field. They do know these things. That is why municipalities are able to determine the impost that they put on developers. They are able to be rather precise about what education will cost, because of certain actions, what is the additional cost to municipal services; police, fire, garbage collection, et cetera, because of other actions. I think this is a field in which they have developed a high degree of sophistication.

Senator Grosart: Who has done the research and where is it available?

Mr. Hignett: It is available in municipal offices, because it varies amongst communities. The Federation of Mayors and Municipalities is one collecting point for this kind of information, although as I understand it, it is mainly an interchange of information.

Senator Grosart: Is it largely guesswork?

Mr. Hignett: No, I do not think it is: I think it is highly sophisticated.

Senator Grosart: Do you know of any specific research project that has been done in this field?

Mr. Hignett: Outside of the municipalities?

Senator Grosart: I do not care where it is; is there a paper? Are there papers in learned journals? Is there a file in Ottawa?

Mr. A. E. Coll, Executive Director, Central Mortgage and Housing Corporation: I think so, senator; the Federation of Mayors and Municipalities through their central office in the last six months have done a survey of the cost of the major services provided on a per capita basis in several ways and they have this information available.

Senator Grosart: This is done on a very general basis then, and averaging basis by the Association of Mayors and Municipalities?

Mr. Coll: Yes.

Mr. Adamson: I have seen the response to this survey and I think the answer to the question Senator Grosart is asking is that this would not serve the purpose of what he has in mind, which is presumably the aggregated study of the work done at the municipi-

palities and trying to put them all together and see how much sense they make?

Senator Grosart: That is exactly it.

Mr. Adamson: Unless there is something of that kind available at, let us say, the Ontario Department of Municipal Affairs, which is entirely possible, no, I would say I do not know of a single aggregative study that looks at the various experiences of different municipalities and tries to make some sense out of them.

Senator Grosart: No, it would be highly desirable that there should be such a study.

Senator Robichaud: You certainly could not take Ottawa as an example.

Mr. Adamson: Ottawa certainly would be one of the contributing sources.

Senator Robichaud: On page 16 of your brief you refer to this patent taken by Convento, which has to do with a sewage disposal unit for an individual household.

Is the government or CMHC taking advantage of this, is it being used in the building of an individual home?

Mr. Hignett: Yes, indeed it is. We have found it necessary to restrict its use in a sense. It took us years to wean the country away from the septic tank. Twelve years ago more than half of all the houses built in Canada were serviced with septic tanks; in Ottawa it was 80 per cent of all houses built. It took us many, many years to get the country away from the septic tank which in some communities caused tremendous problems; the ground pollution in some cities was just fantastic.

The Convento study was one of the steps taken to see if we could not find a device that was a reasonable alternative to the pipe sewer, which we did not regard the septic tank to be, at least on a 50-foot lot.

Senator Robichaud: Ten feet from the well.

Mr. Hignett: Yes, and it has shown a lot of promise but, nevertheless, there is always the danger that if we let the Convento freewheel that the Convento would replace the septic tank and we would go back to the point where half the houses were serviced with Conventos.

This may not be a bad thing, but we do not know enough about it yet to know whether it is good or bad, so what we have been doing is restricting its use in the sense that we have said to the Convento Company and to borrowers, there can be so many in a very large number of communities so that if in some communities they are not working, because they do require servicing, and if they are not properly serviced they fail. So they are still operating with some restrictions.

The Chairman: I would hope so. A final question: On page 7 of your presentation today you say that you have had close relationship over the years with the Division of Building Research of NRC and you go on to say there is now increasing consultation with a number of government departments. Is this recent, and how is it arranged, this kind of consultation?

Mr. Hignett: The consultation with the Division of Building Research goes back to the first year of CMHC when it was decided that CMHC itself would not be a technical research organization. The Division of Building Research was founded in the same year and in the year it was founded its principal purpose was to be the technical research arm of housing in Canada.

So our relation with DBR has been very close and officers of CMHC serve on nearly all the committees of the Division of Building Research. We serve in the development of the building code and this sort of thing. We have sustained it by annual grants these are now of the order of \$150,000 a year.

Our relationships with other departments of government were created by need. For example, with National Health and Welfare, as we got deeper into the problem of housing the elderly, it became evident that "housing" as opposed to an "institution" in the whole range of shelter needs for elderly persons had to be defined. We have worked very closely with Health and Welfare in the field of housing of elderly persons, so that each one of us, CMHC and the department, can, in their own way, take care of the whole range of needs of the old. I think this has been done quite successfully.

Our relationship with Energy, Mines and Resources, for example, came about by their growing interest in pollution. It just happened that CMHC had the only federal legislation that dealt with pollution, the loans and grants for sewage treatment facilities, and since EMO are developing a mandate in this field it has been necessary for us to develop a closer association with them.

We have tried to help Indian Affairs and Northern Development with their Indian and Eskimo problem with some success.

Our relationships with Transport are newer and notwithstanding the fact that we share the same minister. They are developing an interest in research into urban transportation. We share this interest.

So with the passage of time we have taken advantage of every opportunity to form an association with departments of the federal government that share an interest with us.

The Chairman: You are coming back to Ottawa from Eastview. I want to thank you very much, Mr. Hignett, and your colleagues. It was a very interesting afternoon, a little bit frustrating though, because we have not contributed very much to solving your research problems.

The committee adjourned.

APPENDIX "34"

CENTRAL MORTGAGE AND HOUSING CORPORATION

REPORT TO

SENATE COMMITTEE ON SCIENCE POLICY

1. Organization

(your 2.1, page 4)

- (a) & (b) - Attached Organization Chart No. 1 shows the Division and Departments of C.M.H.C. and the Parliamentary reporting channels.
- (c) - The attached Organization Chart No. 2 shows the organization of the Economics and Statistics Division which is involved in intramural scientific activities. Page 4 describes the Advisory Group which is responsible for initiating, negotiating and conducting arrangements for extramural research provided for under the National Housing Act.
- (d) & (e) - Not applicable.

2. Organizational Functions

(your 2.2, page 4)

- (a) C.M.H.C.'s functions and powers regarding scientific activities are set out in Section 26 of the C.M.H.C. Act and in Part V of the National Housing Act 1954. Section 26 of the C.M.H.C. Act reads:
 - 26. The Corporation shall conduct research into the business of lending money on the security of mortgages and for such purpose shall compile information relating thereto.

Section 31 of Part V of the National Housing Act reads:

- 31. It is the responsibility of the Corporation to cause investigations to be made into housing conditions and the adequacy of existing housing accommodation in Canada or in any part of Canada and to cause steps to be taken for the distribution of information leading to the construction or provision of more adequate and improved housing accommodation and the understanding and adoption of community plans in Canada.

A complete copy of Part V of the National Housing Act Sections 31 to 35 is attached as Appendix A.

ADVISORY GROUP - C.M.H.C.

(your 2.1)

- (c) The Advisory Group is responsible for examining housing policies and objectives and where appropriate formulating and recommending new policies to management. The Advisers are also responsible both individually and as a Group for initiating negotiating and conducting arrangements for research and development activities within their fields under the terms of Part V of the N.H.A. either within the Corporation or through outside agencies.

The Advisory Group is made up of seven Advisers, including two Executive Directors of the Corporation and the Director, Economics and Statistics Division. There is also a Consultant Adviser. Two Administrators and two Secretaries complete the staff.

- (b) What organizational policies have evolved.

The scientific research carried out by the Corporation falls into two categories intramural and extramural. The intramural work is in the field of economics and statistics except for the work of one sociologist. The intramural research is policy-orientated and therefore applied in nature. Basic research is minimal, mainly forming a background to housing policy. All other areas of research are carried out extramurally, in the main, through a process of funding. Extramural activities are described under section 2:8.

- (c) The Intramural research involves demographic projections, mortgage marketing, flow of funds to the mortgage market, construction industry statistics, forecast of investment, behaviour of lending institutions. There is a substantial amount of data collection done basic to this research.

- i) The nature of these investigations involves constant liaison with many other Federal agencies and departments. There is a virtually continuous interchange of ideas and information with the Bank of Canada, the Department of Finance, the Dominion Bureau of Statistics, the Department of Trade and Commerce (National Accounts) and the Department of Manpower and Immigration. Close contact is maintained with ARDA, ADB, ADA and the Economic Council of Canada.
- ii) Communications are also maintained with the construction associations, the housebuilding associations, manufacturers of building materials and with financial institutions such as the Canadian Bankers Association, Dominion Mortgage Association, the individual Chartered Banks and credit institutions, and with the economic and research departments of Provincial Governments.
- iii) The Corporation is involved with educational institutions mainly through its extramural funding activities. Study and research projects carried out in the universities and other educational institutions may receive financial support. This is described more fully in Sections 2.8 to 2.9 of this report.
- iv) Corporation economists maintain contact with their counterparts in other nations through international conferences, scheduled visits to corresponding agencies in other countries, e.g. H.U.D. in Washington. There is an exchange of ideas and techniques through these channels. The Economics and Statistics Division maintains an international desk through which progress in other countries is studied.

Co-ordination with other institutions and agencies is a continuing process in response to the changing requirements of the management of the Corporation. It is carried out through personal contact with counterparts in the various institutions and through exchange of reports and information.

- (d) There is a constant assessment of the operational effectiveness of the research processes in relation to the goals and requirements of management. The assessment involves the work content, the techniques used and the effectiveness of the personnel engaged in various facets of research. An annual review and analysis is also carried out by senior personnel.
- (e) There have been no outside studies commissioned (during the last 5 years) to suggest improvement of C.M.H.C.'s operating procedures.
- (f) The powers and responsibilities given the Corporation under the NHA and the CMHC Act are not exercised to the full extent of the legislation. Limitations are exerted by various forces, the scarcity of skilled people, physical limitations of space, financial restrictions.
- (g) An immediate constraint is that created by the current (Oct. 1968) financial stringency.
- (h) No forecast of major changes in organization functions can be made until the Task Force on Housing completes its report.

3. Personnel Policies

(your 2.3, page 5)

- (a) Recruiting teams visit universities and conduct interviews on-campus. The students who possess the necessary qualifications and potential are interviewed at a later date by our professional men in the various fields.
- (b) No unique criteria. Pertinent questions are asked relating to the different fields of research to determine whether these students are interested in research, as such, and if they have the background and knowledge to undertake research work.
- (c) We have a personnel evaluation programme that probes into the performance and potential of our employees. Their competency in research work is referred to our professional administrators.
- (d) This does not apply, since we have very few administrators of research.

- (e) CMHC has an academic assistance programme that provides for "in-company" courses and extramural activities that range from seminars to post-graduate studies in Canadian and American Universities.

4. Distribution of Activities
(your 2.4, page 6)

- (a) Funds expended on scientific activities are not put out on a regional basis per se. The Corporation's intramural and extramural activities are considered essentially national. By its nature the funding of extramural activities may be more heavily concentrated in one region than another. This is the result largely of forces outside the Corporation's immediate control. Where the concentration of universities is greatest and where the academic interest in the Corporation's areas of research has matured the proportion of spending tends to be greater than elsewhere.
- (b) N.A.
- (c,d,e) The research has been largely problem-orientated arising out of specific needs. As such, it does not bear direct relationship to a policy of regional distribution. The Corporation has sponsored or assisted investigations into a number of regional problems e.g. isolated Indian communities, human settlements on resource frontiers and the development of mountain slopes for residential use. It also has a continuing interest in the regional studies of ARDA and ADB.

3. Personnel Associated with Scientific Activities (your 2.5, page 7)

- (a) C.M.H.C. presently has on strength 21 Economists, 4 Supervisory Staff, 4 members of the Advisory Group - total 29. Included in the Advisory Group is one guest worker. There are no post-doctorate fellows and no personnel on loan.
- (b) Eight of the above (Supervisory Staff and members of the Advisory Group) devote most of their time to administrative duties.
- (c) Tabulated information regarding professional staff for the two units associated with scientific activities:-
 - (i) Country of Birth -
 - Bachelor Degree - Canada, Egypt, England and China
 - Master Degree - New Zealand, Canada, Syria.
 - Doctorate Degree - Hungary, Germany, Pakistan, Canada, India, Yugoslavia, England.
 - (ii) Country in which Secondary Education Taken -
 - Bachelor Degree - Canada, Egypt and England.
 - Masters Degree - Canada, New Zealand and Syria.
 - Doctorate Degree - Hungary, Germany, Pakistan, United States, India, Italy and England.
 - (iii) Country in which University Degree Taken -
 - Bachelor Degree - Canada, Egypt, England.
 - Masters Degree - United States, Canada and England.
 - Doctorate Degree - Hungary, Canada, England, United States, Italy.
 - (iv) Number of Working Years Since Graduation -
 - Bachelor Degree - 1, 3, 3, 2, 11, 12, 13, 4, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, 28, 33, 33, 37, 18.
 - Masters Degree - 15, 2, 3, $\frac{1}{2}$.
 - Doctorate Degree - 18, 13, 6, 2, 12, 20, 18, 12.
 Number of Years Employed in Present Organization -
 - Bachelor Degree - 5, 4, 2, 2, 2, 1, 4, 1, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, 22, 22, 16, 22, 8.
 - Masters Degree - 2, 2, 1, $\frac{1}{2}$.
 - Doctorate Degree - 13, 11, 4, 2, 4, 18, 17, 1.
 - (v) Average Age -
 - Bachelor Degree - 43
 - Masters Degree - 29
 - Doctorate Degree - 41
 - (vi) Percentage Able to Operate Effectively in Canada's Two Official Language:
 - Bachelor Degree - 29%
 - Masters Degree - Nil
 - Doctorate Degree - 25%

- (d) Total numbers of professional staff in each degree category for each of the year 1962 - 1968

As at December 31st -

<u>Year</u>	<u>Total</u>	<u>Bachelor</u>	<u>Master</u>	<u>Doctorate</u>
1962	24	5	.)	.)
1963	21	6	.)	.)
1964	20	7	.)	.)
1965	21	7	.)	.)
1966	23	9	.)	.)
1967	30	17	5	8
1968 (estimated)	29	17	4	8
1969	37	21	7	9
1970	37	21	7	9
1971	37	21	7	9
1972	37	21	7	9
1973	37	21	7	9

.) not available

- (e) Percentage of turnover of professional staff in the three degree categories for each of the years 1962 - 1968

As at December 31st -

<u>Year</u>	<u>Total %</u>	<u>Bachelor %</u>	<u>Master %</u>	<u>Doctorate</u>
1962	0	0	0	0
1963	22	.)	.)	.)
1964	30	.)	.)	.)
1965	23	.)	.)	.)
1966	17	.)	.)	.)
1967	27	13	11	3
1968	44	20	12	12

- (f) Percentage of current professional personnel who since graduation have been employed

1. by industry at one time	- 45%
2. on the staff of universities	- 18%
3. provincial departments or agencies	- 23%
4. other federal agencies	- 16%

- (g) Number of staff in each category on education leave - Nil.

- (h) Number of university students given summer employment in the fields of scientific activities for the years 1962 - 1967.

1962	-	5
1963	-	6
1964	-	5
1965	-	8
1966	-	12
1967	-	9

6. Expenditures Associated with Scientific Activities
(your 2.6)

(a) (i) Funds spent on scientific activities - by function						
	(1)	(2)	(4)	(5)	(6)	(7)
	Intramural R. & D. (those detailed in 5(a))	Data Collection	Testing & Standardiz- ation	Support of (i) R&D in Industry R & D in and other	Support of universities	Support of Higher Education in Environ- mental Sciences, Planning Urban & Regional Affairs
1962	216,460	180,580	49,980	34,172	41,461	28,500
1963	198,380	188,160	49,620	33,576	-	27,900
1964	198,570	203,310	52,370	59,645	86,298	30,600
1965	240,145	201,339	48,208	149,050	75,410	31,500
1966	290,836	228,748	53,508	371,104	132,600	146,300
1967	368,290	254,046	50,622	364,240	364,465	575,000
1968	390,387	269,289	53,659	238,766	641,350	705,000
1969(est)	429,425	296,218	56,342	274,580	737,547	800,000

(i) Not included is an annual support grant to the Division of Building Research NRC, of \$100,000 in 1962 and in 1963 and \$150,000 in each of the years 1964 - 1968. "Other" includes research organizations, e.g. Ontario Research Foundation and various research teams or committees established for a specific project or on a continuing basis. Not included are support grants to C.P.A.C. & CURR. C.H.D.C. (mentioned in the text) because funds are not directed to specific research.

6. Expenditures Associated with Scientific Activities (Cont'd)

(a) (ii) Funds spent on scientific activities - by discipline (Items 5 and 6 of Table (i))

Year	Engineering and Technology	Social Sciences			Total Social Sciences
		Natural (1) Sciences	Urban Economics	Inter- Disciplinary (2)	
1962	2,800	23,372	-	49,461	49,461
1963	16,550	17,026	-	-	-
1964	27,735	36,676	13,000	68,532	81,532
1965	24,000	25,000	80,250	95,210	175,460
1966	339,600	36,470	39,634	88,000	127,634
1967	260,810	271,310	85,125	372,270	457,395
1968	112,550	154,000	265,686	347,880	613,566
1969(est)	224,752	*	**	**	439,484

(1) Includes biological and chemical and ecological.

(2) Includes projects or programs which normally involve a combination of the social sciences: economics, behavioural and environmental sciences.

* Method of allocation does not warrant Projection.

** Total projected only.

6. Expenditures Associated with Scientific Activities (Cont'd)(a) (iii) Funds spent on scientific activities - by area of application (Items 5 & 6 of Table (i))

Year	Construction	Transportation	Underdeveloped & Regional	Economic Policy	Social Welfare & Social Policy		Educational Techniques	Others
					Social Policy			
1962	26,172	-	-	-	41,461	-	-	8,000
1963	33,576	-	-	-	-	-	-	-
1964	64,411	-	-	13,000	36,432	22,500	22,500	9,600
1965	49,000	18,500	-	16,700	67,650	22,500	22,500	50,110
1966	386,604	-	-	28,000	62,000	12,000	12,000	15,100
1967	242,170	15,000	171,100	11,125	239,770	1,000	1,000	48,540
1968	212,550	-	130,000	168,450	231,140	6,236	6,236	131,740
1969(est)	308,485	*	*	*	195,396	*	*	*

* Allocation in response to outside initiation does not warrant projection.

7. Operating and Capital Funds Associated with Scientific Activities
(your 2.6)

(b) (Economics and Statistics Division and Advisory Group)

1962	\$254,000
1963	241,000
1964	257,000
1965	285,000
1966	336,000
1967	321,000
1968	322,000

- (c) Funds expended to further professional university education of staff for each of the fiscal years from 1962 to 1968 (e.g.) costs of educational leave to take higher degree, payments to cover costs of taking courses at local universities has been minimal totalling some \$5,000 for the period 1962-1968.

8. Intramural Research Activities
(your 2.7)

- (a) (1) The intramural activities of the Corporation provide a service to management to assist in policy making. Projects are selected as directed by management or in anticipation of problems.

Interaction between the Corporation and other Federal Departments or agencies is an important element of research projects. Basic information may be supplied to the Corporation if another department or agency has established procedures in areas of mutual interest or where projects have overlapping implications. Departments or agencies which may be involved include Finance, the Dominion Bureau of Statistics and the Economic Council of Canada. The initiation and monitoring of a project is carried out by the agency undertaking the project if done outside the Corporation.

- (a) (2) There is an established program of intramural research which provides the information needed to support decision making. Requests for special projects or studies are given priority on the basis of the urgency of the request. The priority may be determined by management or by the Director of the Division responsible for the research.
- (a) (3) The critical path network and programme evaluation and review techniques are not used to plan and monitor intramural programmes and projects.
- (a) (4) Contracting out of projects in support of intramural programmes of research has not been used in the past.

Extramural Activities

(your 2.7)

- (a) (5) The policy of Central Mortgage and Housing Corporation for funding extramural research programs in the university and in industry is established by the terms of the National Housing Act, 1954, Section 31, as quoted at the beginning of this report. Sections 32 and 33 of Part V of the Act set out as matters for investigation a wide range of research, information and developmental activities in the economic, social and physical sciences as they relate to housing and urban affairs. Funds are available for these purposes under the Act and the Corporation's responsibility in this respect is in large measure carried out through grants to research undertaken outside the Corporation. Grants are given to projects with the general purpose of adding to the knowledge and understanding of housing and urban conditions as well as for applied research.

There has been for many years a close relationship with the Division of Building Research of the National Research Council. There is now increasing consultation with such departments and agencies as Transport, Manpower and Immigration, Industry, National Health and Welfare, Energy, Mines and Resources and Indian Affairs and Northern Development and the Canada Council. Close liaison is maintained in an attempt to complement and integrate with the research activities of other Federal government departments and agencies which have mutual interests.

- (a) (7) Interchange of knowledge is carried out through publications and through meetings of personnel. Publications include, Canadian Housing Statistics, an annual, and a monthly supplement; Housing Studies (bulletins), a Mortgage News Letter and through replies to direct requests. Corporation personnel attend meetings of various financial, economic and statistical organizations, e.g. the Organization for Economic Co-operation and Development and the International Monetary Fund.

For transfer of extramural results refer 2.7) b.7) and 2.8)

- (b) (1) The funding of extramural scientific activities is the concern of the Advisory Group of the Corporation. The Group is composed of specialists in the fields of architecture, house construction, community planning, economics and urban affairs.

The funds for research may be advanced to universities, other educational institutions, research organizations, associations which have research facilities and to individuals working independently or associated with the educational institutions.

The extramural research may be one in which the activity is initiated by the Corporation, one in which the Corporation responds to activities initiated outside the Corporation or one arising from a mutual interest. Members of the Corporation's Advisory Group have been much involved in conferences and discussions where an idea appears from which negotiation follows and a project is formulated.

Proposals for projects or programs are submitted to the Advisory Group which evaluates the application. It is judged on conformity to the objectives of Part V of the Act, on the Proponent's ability to sustain and complete the work, and on the estimated cost relative to the resultant benefit. If the subject of a proposed investigation is highly specialized, outside advice in the particular field may be obtained. If the proposal qualifies for support a recommendation for approval and funds is made by the Advisory Group to the Corporation's Executive Committee or Board of Directors. In some cases approval by the Privy Council is also required. When the necessary approvals have been received the terms of reference are incorporated in an agreement between the Corporation and the proponent.

Support is given by the Corporation to projects undertaken by agencies having areas of mutual interest. Typical of this group are the National House Builders Association, the Ontario Research Foundation, the Pulp and Paper Research Institute and the Atlantic Industrial Research Institute. The Corporation's Advisory Group may initiate the program or project or through negotiation reach agreement with the agency on the work to be undertaken. When the terms of reference are satisfactorily established the process of funding is as described above.

The Corporation does not maintain laboratory facilities for research in the physical sciences, but instead recognizes the Division of Building Research of the National Research Council as its agency for conducting scientific research in building materials and systems. The Division of Building Research undertakes, on request, field studies, testing and evaluation of materials and joins with the Corporation in undertaking, sponsoring and supervising experimental work in housing construction. By agreement an annual grant under Part V of the NHA is paid to DBR in recognition of services performed.

A number of organizations have been established outside the Corporation to fill specific purposes in the improvement of conditions in housing and the urban environment. The Corporation may provide support of a continuing nature to these, some of which have within their overall programs areas of information, education and research. Organizations which receive such grants are the Canadian Housing Design Council, the Community Planning Association, and the Canadian Council on Urban and Regional Research, which may itself give research grants. Support funds are provided on an annual basis on consideration of a submission outlining a yearly program. The Advisory Group evaluates the program and if it meets the requirements approval and support funds are recommended as outlined above.

- (b) (2) The number of people with advanced knowledge in the areas of research related to housing and the university facilities which could be devoted to these problems have until recently been limited. Indeed, much of the Corporation's effort has been in encouragement to undergraduate and postgraduate students through training and education grants or fellowships to take advanced studies in preparation for independent research in the field of housing. The inherent worth of a proposal

and the ability of a proponent to bring it to a successful conclusion have been deciding criteria in acceptance. There has been, of course, emphasis on the most critical problems of a particular period. For example, community planning education received special attention in the early years. Through the pressures exerted by increasing urbanization there is an urgency to extend research into these areas. With the increase in the number of urban renewal and public housing projects, the inherent social problems became more evident and more resources are being devoted to research of this nature. The housing problems of ethnic groups and those of frontier areas are now receiving greater consideration. The volume of viable application in the past was not so great that priorities were a problem. There is, however, now an opportunity to develop a more selective program and by examination separate out the most significant proposals in the large subject areas.

(b) (3) The Corporation has not established a fixed system of monitoring. Projects are reviewed by means of progress reports and discussion. A formal agreement sets out the terms of reference and includes an arrangement for disbursements as the project proceeds. In cases in which a university is involved the agreement is made with the university and funds are disbursed through the university.

6b) (4) N.A.

(b) (5) The Corporation has not used the Critical Path Network or the Program

((6) Evaluation and Review Technique to monitor programs. This would not be generally practicable with extramural activities in which the day to day operation is not under immediate surveillance. In experimental or developmental projects the agreement between the Corporation and the proponent may make provision for termination or redirection of effort.

(b) (7) The results of extramural activities are made known by way of published books, reports and articles, which are circulated among interested organizations, publication in journals, response to direct requests and arrangements for the production in those areas involving material items.

(b) (8) Of the funds spent under Part V NHA in the years 1962-1967 the following percentages were spent on extramural research projects:

1962 - 18.4%	1963 - 19.2%	1964 - 12.9%
1965 - 22.3%	1966 - 23.7%	1967 - 31.9%

(b) (9) N.A. Tabulations of funds requested for projects which have been rejected are not made.

(your 2.8)

(1) A patent has been taken out by Canadian Patents and Development Limited for the "Converto", an aerobic sewage disposal unit for individual households. The developmental work was done by the Ontario Research Foundation over a 10-year period with the assistance of grants from the Corporation. Production has been licenced to the Converto Company of Canada Limited.

Patents have been applied for by Reff, Plastics Ltd., Weston, for a prefabricated fibreglass bathroom. Development of a prototype and moulds were assisted by a grant. Rights to production have been purchased by Crane of Canada Ltd.

- (2) Among publications arising from research projects supported by funds
(3) granted under Part V of the National Housing Act are:

"The Urban Frontier", published by the Lower Mainland Regional Planning Board, New Westminster, B.C.

"Subdivision Casebook", published by the Planning Institute of British Columbia.

"A low cost Housing Study for Winnipeg", University of Winnipeg.

"New Forms of Family Housing", published by the Canadian Housing Design Council.

"Housing Study - Isolated Communities and Indian Reserves Prairie Provinces", published by Kennedy/Smith Associates, Winnipeg.

"The Political Economy of Urban Changes in Canada", published in Queen's Quarterly - Winter 1961.

"The Social Aspects of Urban Renewal", - Community Welfare Planning Council of Winnipeg.

"An Investigation of Individual Household Aerobic Sewage Treatment Units" and "Individual Household Aerobic Sewage Treatment Units", published by the Ontario Research Foundation.

"Treatment and Disposal of Waste Water from Homes", published by Alfred P. Bernhart Associate Professor Dept. of Civil Engineering, University of Toronto.

"Decentralization of Urban People and Manufacturing Activity in Canada", Canadian Journal of Economics and Political Science, February, 1961.

"A Guide to Cooperative Housing" and "Cooperative Housing Administration Manual". Institute of Social Action, St. Patrick's College, Ottawa.

"The Social Implication of Public Housing in Metropolitan Toronto", The Metropolitan Toronto Housing Authority.

"Urban Transportation in Canada", Canadian Federation of Mayors and Municipalities.

- (4) Conferences for the exchange of information have been supported by the Corporation. Other means employed for publicizing results are Journals, circulated reports and seminars. The Division of Building Research, NRC, which receives a support grant publishes results of its work in the housing field.
- Vising foreign missions associated with housing are briefed by Corporation officials and visits to significant design or experimental projects arranged. Corporation personnel have made similar visits to foreign centres. As an information function the Corporation publishes two magazines, "Habitat" and "Urban Renewal". These may carry articles on the results of research but are in general directed to a non-scientific audience.
- (5) The Corporation maintains a housing library in which a large number of books and periodicals originating outside Canada are available. The Corporation does not at present maintain a formal procedure for the transfer of foreign based works to extramural groups. Studies and discussions are now taking place on the establishment of an information centre where an inventory of work done in Canada and in other countries could be maintained.
- (7) There have been limited resources in both people and expertize and only recently has any substantial program been developing under the funding arrangements which could provide the opportunity for research teams to grow. Supported activities have to a considerable extent been too widely distributed to nurture this growth. A team working in the Ontario Research Foundation on the problem of household waste disposal has acquired a substantial body of knowledge and technical ability in this field. Support has been provided for some years to this program. A new development has been the emergence of interdisciplinary groups in centres of research and some of the universities - Montreal, Toronto, Waterloo and Manitoba. These centres, which are receiving support and encouragement from the Corporation, provide the milieu for the development of skilled teams and techniques. The Division of Building Research also provides the continuity for this kind of development. While DBR receives a support grant from the Corporation, such development would be considered an internal achievement.
- (8)
- (9) The Corporation's funding of extramural work must be regarded as modest when related to the vast scale of money and manpower being invested in Canada on urban growth. Nevertheless it represents a very considerable body of work on a very wide range of subjects carried out by a large number of people in all parts of the country. Much of the work has been exploratory and isolated. There is, however, an increasing movement towards integration and an interdisciplinary approach to the forces underlying the urban complex.

Much of the Corporation's funding has been directed to the training of skilled people through graduate studies. In the last three years a greater proportion of funds spent extramurally has been used for this purpose than for research projects. With the growing number of skilled people there is now an opportunity to develop a more selective and structured program of research in the fields of housing and urban growth.

In building technology there has been a particular attempt to solve the problems of waste disposal and a search for the use of new materials and innovations in construction by building experimental houses. The social problems of disadvantaged people are now receiving more recent attention.

(Your 2.9)

- (1) Among intramural projects conducted have been "Housing requirement projections to 1981", and an "Evaluation of the Mortgage Insurance Fund".

Among extramural projects undertaken during the past five years of a continuing nature are the following:

The Corporation and the Research Committee of the National House Builders' Association collaborated in the construction of a series of experimental houses. These have been in part to study new materials and heating and sanitary systems. The experiments have been observed by scientists of the Division of Building Research, National Research Council, and reports on the results have been circulated among interested builders.

The Ontario Research Foundation has carried out a sequence of developmental investigations under the title "Kinetics of Oxidation". This led to research into the basic processes of sewage treatment and the development of two types of individual household treatment units. This research has been assisted over a ten-year period by an annual grant from the Corporation. The original aim of the investigation was to evolve a system better than septic tank disposal and to deal with problems of sewage disposal in the far north. Two other experimental programs have evolved out of this work in collaboration with the Department of Health and Welfare, one dealing with toxic action of ozone and the other with the kinetics of sewage bio-oxidation. The process of developmental work continues.

A grant supported a further study undertaken by the Ontario Research Foundation to determine the feasibility of developing self-contained sewage, garbage and water treatment apparatus for large building complexes. The results indicate that the apparatus is feasible. Further developmental work is required.

The Pulp and Paper Research Institute undertook an investigation into the adaptation to individual household systems of disposal techniques developed for industrial purposes.

The Atlantic Industrial Research Institute has commenced an extensive study of pollution due to storm water and overflows from combined sanitary and storm sewers.

The development of moulded plastic bathroom units is receiving assistance. Prototypes have passed the preliminary experimental stage and development.

is proceeding under purchased rights to production.

The Province of Saskatchewan, with a supporting grant, undertook an examination of the probable effects of the development of the potash mining industry on housing and community development in the potash region of the Province. A report of the findings serves as a reference for community developmental proposals.

The Ontario Research Foundation has undertaken the development of a new manufacturing process designed to find a better way of making bricks or brick substitutes.

A private firm has received support for a study of the transportation corridor concept to determine whether or not it is possible to establish sound engineering and economic criteria for the design of transportation corridors.

A study on the application of computer techniques to housing design has been undertaken with assistance of a grant.

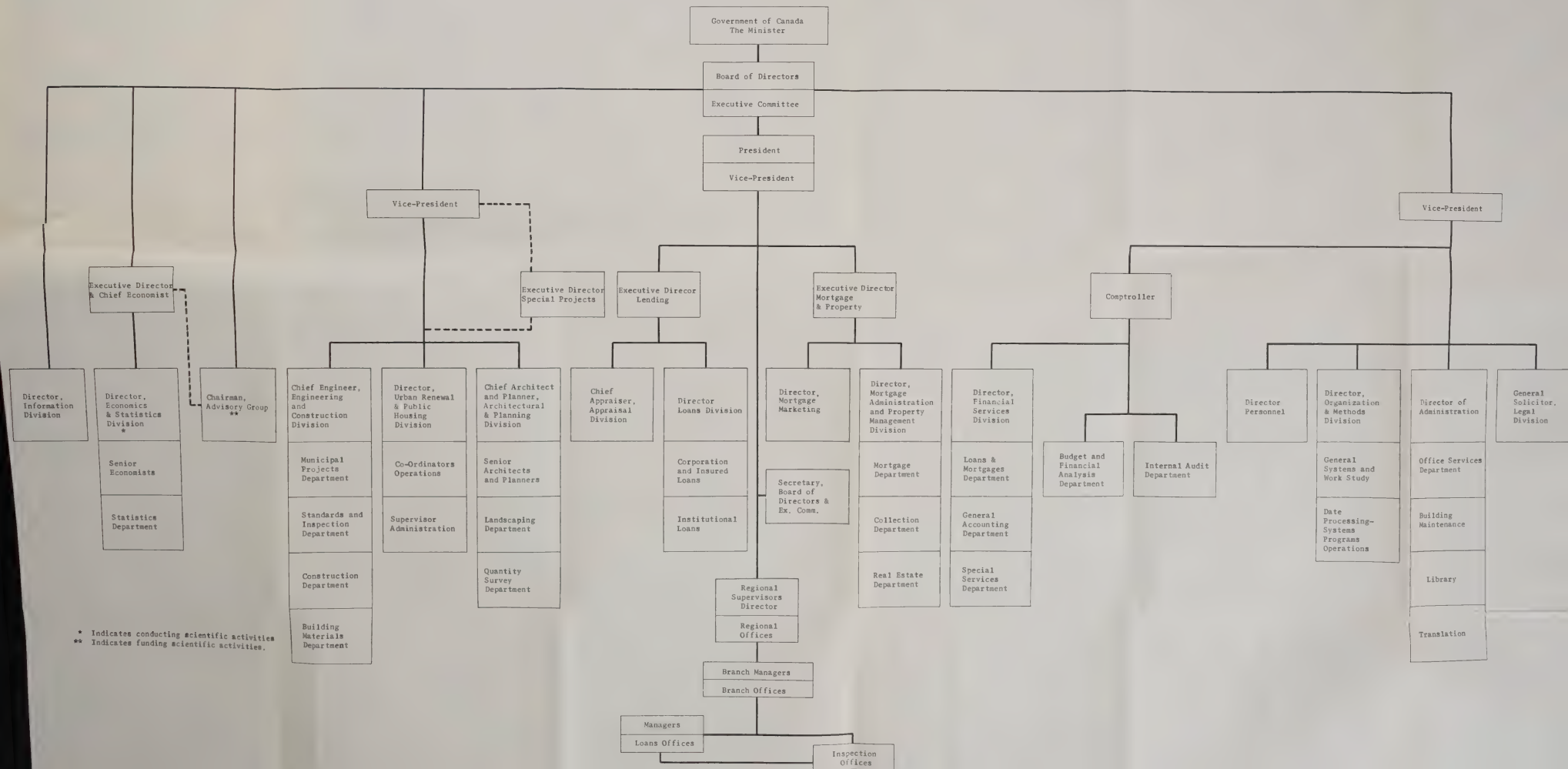
The Community Chests and Councils of Greater Vancouver carried out a study over three years dealing with social services required by multi-problem families.

The Quebec Welfare Council undertook a comprehensive study of the social circumstances and the community organization of low-income people who might be affected by housing and renewal action in a number of Quebec cities.

The Centre for Urban and Community Studies of the University of Toronto has commenced research into factors of density costs, design practices, building techniques and land uses to determine the benefits of alternate forms of housing.

The Community Welfare Council of Winnipeg carried out a study of "The Social Aspects of Urban Renewal" using a local project area as a base. A report has been published.

CENTRAL MORTGAGE AND HOUSING CORPORATION





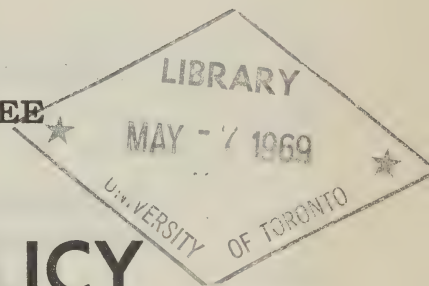
First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 34

WEDNESDAY, MARCH 5, 1969

WITNESSES:

DEPARTMENT OF FINANCE: R. B. Bryce, Deputy Minister; A. B. Hockin, Assistant Deputy Minister, Economist, Analysis and Government Finance Branch; F. H. Leacey, Head, Economic and Analysis Division.

APPENDIX:

35.—Statement by the Deputy Minister of Finance.

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry.

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

“With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, March 5, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Bélisle, Bourget, Grosart, Kinnear, McGrand, Robichaud, and Yuzyk—8.

In attendance:

Philip J. Pocock, Director of Research (Physical Science)

The following witnesses were heard:

DEPARTMENT OF FINANCE:

R. B. Bryce, Deputy Minister;

A. B. Hockin, Assistant Deputy Minister, Economic Analysis and Government Finance Branch; and

F. H. Leacey, Head, Economic and Analysis Division.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 35:

—Statement by the Deputy Minister of Finance.

At 12:10 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Bryce, R. B. Mr. R. B. Bryce has held his present position as Deputy Minister of Finance since July, 1963. Mr. Bryce was born in Toronto and graduated from the University of Toronto with a Bachelor of Applied Science degree in Mining Engineering in 1932. He then transferred to Economics, which he studied at Cambridge from 1932 until 1935, taking a B.A. degree, after which he attended Harvard for two years as a Commonwealth Fund Fellow. Mr. Bryce joined the Public Service with the Department of Finance in 1938. During World War II, he was Secretary to the Government's Economic Advisory Committee under the late Dr. W. C. Clark, then Deputy Minister of Finance. This Committee dealt with various matters relating to economic policy and organizations, and was particularly concerned with financial arrangements with our Allies. In 1946, Mr. Bryce became the Executive Director for Canada of the International Bank for Reconstruction and Development in Washington. In 1947, he was appointed as Assistant Deputy Minister of Finance and Secretary of the Treasury Board, which was then part of the Department of Finance. On January 1, 1954, Mr. Bryce became Secretary to the Cabinet. He remained in this position until assuming his present responsibilities in July, 1963. In December, 1967, Mr. Bryce received the 1967 Award for Outstanding Achievement in the Public Service of Canada. In 1968, he was appointed a Companion of the Order of Canada.

Hockin, A. B. Mr. Hockin was born in Winnipeg, Manitoba. He holds a B.A. Honours degree from the University of Manitoba and an M.A. degree from the University of Toronto, both in Economics. Mr. Hockin joined the Department of Finance in 1946. His earliest duties with the Department included work on the entry of Newfoundland into Confederation, agricultural and other resource development matters. He was a member of various Canadian delegations to meetings of FAO and UNESCO. During postings to London and Paris he participated in the formative stages of NATO and OEEC. After his return to Ottawa in 1953 he worked in the then International Economic Relations Division, first on defence matters and then on commercial policy. He was a vice chairman of the Canadian GATT delegation in 1956. In 1957 Mr. Hockin did a two-year tour of duty in Washington as the Canadian Alternate Executive Director of the International Monetary Fund and the International Bank for Reconstruction and Development, and as Financial Counsellor at the Canadian Embassy. In 1959 Mr. Hockin returned to Ottawa to establish a new division in the Department of Finance, that of Economic Analysis. That division was expanded in 1961 to include financial affairs. In 1964 Mr. Hockin was appointed to his present position as Assistant Deputy Minister of the Branch, which includes the Divisions of Economic Analysis, Government Finance and Capital Markets, International Finance and Crown Corporations Financing.

Leacy, F. H. Mr. Leacy was born in England. He holds a B.A. Honours degree from the University of British Columbia and has done extensive post graduate work in Economics at the University of Washington and Columbia University. Mr. Leacy joined the Department of Finance in 1964 as head of Economic Fore-

casting in the Economic Analysis Division. Prior to that date he was senior statistician with the Royal Commission on Taxation (1963) and with the Statistical Office of the United Nations (1961). He was with the Dominion Bureau of Statistics from 1946 to 1961, successively holding the positions of Chief of Prices, Chief of National Accounts and Director of the Research and Development Division. He has contributed a number of articles on national income and prices to various economic journals.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, March 5, 1969

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, we have had up to now some agencies which have perhaps claimed to do more than they were actually doing in terms of research. This morning we have a new type of agency. We have a reluctant department, which I believe is really too humble about what they have been doing in terms of research but, knowing Mr. R. B. Bryce and his associates for some time, I am not surprised at this very sincere humility.

I have admired Mr. Bryce for a number of years as a very devoted public servant and I am quite sure that he was very sincere in saying that what they were doing could not be called real research, but again I think it was an understatement.

We are very glad to have you and your associates with us, Mr. Bryce. I understand that you want to make a brief statement to start with, and then we will have the usual question period.

Mr. R. B. Bryce Deputy Minister, Department of Finance: Thank you, Mr. Chairman. I sent over yesterday, or the night before, an opening statement, thinking that it is not really a brief but giving some of the information which the committee has requested, particularly in the appendices about our staff and so on and giving some descriptions of the objectives and the manner of working of the department.

As you indicate, Mr. Chairman, and as I say in this written statement that I sent around, I feel it a bit presumptuous to call what we do research. We try to do useful work; we try to do analytical work; we try to

do critical work; but we normally publish only the odd budget and white paper.

The Chairman: And budget speech.

Mr. Bryce: And budget speech. The budget speech is essentially the work of the Minister, who has to take responsibility for it; the white paper he tables, but we produce it for him of course, and he goes over it. But we have not put out many publications other than these and press releases, and a few things of this sort—with one possible exception. Some years ago, Mr. Rubinoff and I prepared an economic report on the Canada Pension Plan proposals, which was a fairly lengthy document that was submitted to the committee of the House of Commons dealing with the pension plan and is an example of the sort of work that the department has to do on a major project of that kind.

However, I think that the essential role of the department, if I can claim it, is to help the government in innovating, in the terminology that you have been using and the science council has been using.

We try to take the results of other people's research and investigations and develop proposals or criticize proposals and help the government to emerge with the best measures either to lay before Parliament or to carry out under the powers that it already holds from Parliament. That requires all the effort and intelligence and knowledge that we can bring to bear on it.

In doing this work as I have indicated, we employ some 160-odd officers now who are organized in the way which is set forth in that little yellow sheet that is attached to the statement that I sent around. The statistics about their education and things of that sort are also given in the appendix to that statement.

I will not try to go over all that is in the written statement, Mr. Chairman; I thought it would be better if I just gave this very brief

introduction and leave it to the members of the committee to raise whatever questions they wish.

The Chairman: Thank you very much, Mr. Bryce. I want to add at this moment that the Deputy Minister of Finance is accompanied this morning by Mr. Hockin, Assistant Deputy Minister and Mr. Leacey, who is head of the Economic and Analysis Division.

Mr. Bryce: Mr. Leacey is acting head at present; Mr. Rubinoff is over in Paris, as so many of my staff usually are, attending the OECD, or something of that nature.

The Chairman: Senator Grosart?

Senator Grosart: Thank you Mr. Chairman. May I add to the Chairman's welcome my own, Mr. Bryce. I am sure we are delighted that you were able to come before the committee, because we are told at times that the real science policy decision maker seems to be the Treasury Board, which is at least an affinity of yours.

I find some very interesting statements in your brief I would like to ask you, if I may, just a few questions for further information and clarification.

The first statement that I find very interesting is in paragraph 2: "The department has no general statutory definition of its duties"... I am questioning this statement because in this committee we are searching desperately for evidence of control going beyond coordination in federal government funding of science expenditure. Some of us had been under the impression that there might be a very substantial degree of control exercised through Treasury Board and in the final analysis through the Minister of Finance.

I find my text for that in the Financial Administration Act, in section 9, which says—and this is in Part 1 of the Financial Administration Act—is headed Department of Finance. Section 9 reads:

The Minister has the management and the direction of the Department of Finance, the management of the consolidated revenue fund and the supervision, control...

And I emphasize that word—

...and direction of all matters relating to the financial affairs of Canada not by law assigned to the Treasury Board or to any other minister.

May I ask you, would your department exercise any measure of control of the expenditures on science?

Mr. Bryce: Senator Grosart, there are times when I wish I could exercise a lot of control over all sorts of expenditures, but the essential controls are exercised by ministers having responsibility for various programs. They have got budgets; they have got authorizations by the Treasury Board under other sections of the Financial Administration Act and by the Cabinet.

When I say control, it stops there. We exercise, I hope, influence and persuasion on those bodies that do exercise authority over the others. We have to have our say, to do what we can, by way of influence and persuasion.

The government does not lack for central control agencies or authorities; the problem is to have them work effectively and have them work sensibly.

The great bulk of our work is to try and participate in the work of the cabinet committees directly. The advice we give our minister and the advice we give to cabinet committees and the Treasury Board is for Consideration in the decisions of the Cabinet and the Board.

We do not, despite that rather wide wording of the Act, which is quite old wording, in fact exercise direct control. I cannot tell the National Research Council what they can spend or the Department of Energy, Mines and Resources. Sometimes when the departments are concerned about their expenditure programs they will express that concern to me or to my officers as well as to the Treasury Board but, frankly, in the interests of good administration we try to have them deal directly with the Treasury Board and those who do exercise control.

We confront them in the cabinet committees and endeavour to debate there with them on those aspects of matters that we are expected to express a view on, but we do not exercise a detailed control or authority ourselves, because if we did there would be just too many authorities from a managerial point of view.

We try to work on the control authorities themselves. Now, as I have indicated there are the odd things where we are the operating department, but those are exceptional. We are the innovating department in a good many others; such as taxes and tariffs where we originate ideas, proposals and our minis-

ter puts them up to the cabinet or to whatever committee of cabinet is appropriate, and the cabinet and ultimately Parliament takes a decision; then somebody else administers it.

Now, we are to blame within the machinery of government if those proposals are not well thought out, if they are not right, but we work through the government on these things. These are major issues of policy, essentially.

Consequently we do not exercise control over others in the words that the Financial Administration Act would contemplate. One must bear in mind that that is a very old statute and a very old provision in there, which has gradually been eroded by the development of highly organized central control agencies such as the Treasury Board and the various cabinet committees and managerial authorities.

The Chairman: Might I ask a supplementary question related to this one: When you say at the bottom of page 8 and the top of page 9 that:

Broadly speaking, it may be said that the Treasury Board department concentrates on managerial matters and departmental budgets while the Department of Finance concentrates on economic matters and the government budget.

You would not include there any kind of special assignment for the Department of Finance in reviewing what we tend to call overall science policy as opposed to science policies by sectors. We have been told by Treasury Board, for instance, that they are looking at science policies by sectors, what is involved, for instance, in the Department of Health and Welfare so far as health research is concerned and so on, but, apparently, the Treasury Board does not look at overall science policy.

I wonder if you would have anything to say about this in so far as the Department of Finance is concerned?

Mr. Bryce: The government looks into some general issues of science policy from time to time and the department has been involved in some consideration of that in years past.

For example, I think it is fair to say that we initiated the shift from the incentives given in the tax statute for research and development expenditures by industry to direct grants to the purpose. First we had some role in getting these provisions into the

tax law. That was before I was there, it was done in 1962 or 1961.

Then, in the change from that to what is now IRDIA, this was made frankly at our initiative to get it out of the tax law where I felt that it worked unevenly, somewhat inefficiently into a straightforward system of grants with the conditions for them laid down by law.

The department took an interest there in both the desirability of having a greater industrial participation in research and secondly in the form in which that was promoted.

Since then, this has been taken over by the Department of Industry and they have worked on it we have not endeavoured to do any more detailed work on it except to review from time to time the scale on which it is being done and any significant changes in it.

We look at it as essentially an economic measure, a means of promoting R & D in industry for its economic purposes. That is one example of how we have been involved. I would like to see us do more in the field of economic values, the economic role of research and development, but we are short-handed and we cannot do everything. I think it is fair to say that no one has yet developed a sophisticated and, if you will, "scientific" way of relating the scale of R & D efforts to economic policy.

The Science Council in their paper on science policy mentions their efforts to try to get some relationship worked out. The same is true of the Economic Council in their chapter on this. We would all like to find some clear-cut relationship that would enable us to get the clue to the interrelation between productivity and research and development. We are all aware that the important thing is that the fruits of research and development should be used and I think that is true in what has been said to you by other witnesses.

We have had no special expertise to bring on this matter; our main participation has been in regard to a number of measures such as that IRDIA one that I have mentioned.

Senator Grosart: As the Chairman said, you are very modest about your own research efforts, but there is considerable evidence in your brief that you do a good deal of research as part of your normal activities.

Perhaps because of your elevated position in the government you may not feel that you

are under the same requirement that some other departments are to classify expenditures, and this, of course, is perhaps the reason why you have not done so. However, to put my first question in a broad context, do you see a place for the Department of Finance or perhaps somebody else looking at the total federal expenditures and noting that there is a billion dollars that will be spent this year on science R & D, and asking, "Is this the right amount?"

You mentioned the OECD comment and the Science Council comment that in 1966 R & D expenditures in Canada were 1.3% of GNP. There is a general feeling that perhaps 2% might be a more adequate figure yet the Science Council says it has not been able to find any relationship. Surely somebody in the government *has* to find a relationship if we are going to be sure this is the right amount to spend.

It would seem to me that it is a function of the Department of Finance, to determine whether we are spending too much or too little on R & D. If the Department of Finance is not going to do it, who should do it?

Mr. Bryce: First let me say a word about the general question of priorities. In the end this has to be a matter for the cabinet, because I think it is fairly well known now that we are a bit short of money and that we do not have enough money, resources, or whatever term you want to use, to meet the desires of the governments or the parts of the governments to do all the things they think are wise, right and desirable.

There is an elaborate machinery for considering these various proposals that come from agencies, that come from departments, that come from ministers, that come from groups of ministers; these have to be reconciled and some priorities applied and some planning done.

We participate in that collective process and to it actively. The central work on priorities now is done by a group of cabinet committees; I do not know how much I am supposed to describe the cabinet committees as an old officer of the Privy Council.

The Chairman: I think most of them have been described in public, except their composition.

Mr. Bryce: In any event, we have various committees that deal with particular aspects.

Then we have now a cabinet committee on priorities and planning, which endeavours to reconcile these priorities. In the central work of appraising or helping the ministers to appraise relative priorities the department takes part as well as the Treasury Board Secretariat and the Cabinet Secretariat, and we all have our inputs.

It falls to my lot to express views to ministers on these things and, of course, in that I am assisted by the staff and I am controlled by my own minister.

The decisions as to whether science should get more or less tend nowadays, as Mr. Reisman has indicated, to be associated with particular projects, particular programs. On the other hand, we do know the general totals that you have seen; we know the scale or orders of magnitude of our scientific effort and the directions it is taking and in the discussion of general priorities those are general considerations that we bear in mind.

I think it is fairly well recognized that various kinds of research and development work will help to contribute to productivity, to economic growth, to the solution of the kinds of problems that are outlined in that report of the Science Council on Science policy. But unfortunately they have got to be weighed up against other priorities for government funds, which are an enormous variety and which have behind them other considerations.

The highest priority I suppose, if you look back in the last dozen years in Canada, has been given to expenditures for the old and the sick and the poor; science does compete with these and this is a very tough kind of comparison to have to make; a multitude of other things, culture, foreign aid, a variety of things of this sort, have also to compete with it.

In the end it is very hard to do such allocation of funds on either a formal basis or a "scientific" in quotes, basis.

But it goes on and we try to reconcile these considerations.

Senator Grosart: Do you see a function for some mechanism of hard research to resolve this kind of problem?

The mechanism that you describe has been going on for a long time yet in the field of science policy we are faced over and over again in this committee with this situation that over the years we have developed a definite imbalance in R & D expenditures.

The OECD pointed out that in this we were out of step with other countries; this seems to have been generally accepted. It has been repeated over and over again; the Science Council, the Science Secretariat and other people have done so, but we have not seen any evidence, or I have not seen any evidence, that this has been examined, that anybody has said implied OECD criticism may be because Canada is a different country in many ways to these others.

Do you see a place for this kind of hard research so that if we decide to move money from inhouse into industry, or into the universities, we know why?

Mr. Bryce: I know that ministers are aware of the views of those with direct knowledge and experience in the scientific research field. It is exemplified best by the Science Council on the importance of getting more done in the universities and in industry.

We have in the Department of Finance backed the importance of getting more of the R & D work done in industry and in universities because our interest, I suppose, is not primarily intellectual; it is economic and we feel that if the scientific work, development work, is to have fruitfulness in increasing Canadian productivity and improving the Canadian standard of living it has got to be translated into behaviour of industry.

We were convinced by the arguments that we read and heard that more work had to be done in industry if industry was going to be able to take the results of R & D work and translate them into changes in technology or products, or whatever it may be.

In that general sense I think the government has been well aware, and certainly many of us advising it, have been well aware, of this desirable trend in policy, and I think that this was brought to bear several years ago at first under the Diefenbaker government in the income tax provisions about research and development expenditures in industry, then under the Pearson government in the various proposals for the Department of Industry programs to support research and development in industry.

Of course, a lot of more of it gets done in addition by specific decisions on specific needs.

I well remember the whole crisis over the Arrow, whether we should go on with it; I was right in the middle of it in those days. This was a very difficult decision. One gets

into difficult decisions about other programs from time to time, so that it is not just as a broad, general policy that we aim at X per cent, or something.

However, when money is short you give what emphasis you can to it, but in the end the politicians have to decide, uncomfortably, whether they are going to put more into this, or that, or the other general field.

Senator Grosart: The feeling here in this committee is I think that some entity of government should undertake the responsibility of doing scientific investigation into this problem of the balance between expenditures within the R & D sector.

For example, it appears that the imbalance, if such it was, was the result of a lot of ad hoc decisions in different departments at different times and their responses to different occasions and crises. Now, if this continues is it not possible that five years from now we will have another OECD report which will say that instead of getting into balance we have gone too far, or have not gone far enough. How do we know that we will have a proper balance in terms of the public interest, in terms of our resource capabilities five years from now in this field unless somebody does this hard research?

Mr. Bryce: Are you talking here, Senator, about balance within the R & D program generally, or between the R & D Program and other broad fields?

Senator Grosart: Both.

Mr. Bryce: As regards the balance between the R & D program and other broad programs, this essentially is a question of high policy, if you will, that the government itself has got to focus on and focus on at least annually in deciding how much of the budget that it finds now limited because its revenue fields we feel are limited and its expenditures are growing rapidly in various directions, how much it feels it can decide to give to those programs that contain major R & D features and how much it will devote to other programs.

This is done essentially in the various cabinet committees and the Treasury Board in looking at overall programs annually, in setting program objectives, in dealing with estimates and in dealing with specific programs like regional development, industrial incentives and things like that, that are going to have a major impact on the financial picture.

In that process I feel myself that no particular new machinery is needed; we want to make the existing machinery work better.

I think there is some further work that could be done on the economic value of R & D. I am not exactly sure where that belongs, because there is the Science secretariat, there is the Treasury Board Secretariat, there is our department and there is the Economic Council, all of which have got some reason to look at it.

Senator Grosart: But nobody has the responsibility.

Mr. Bryce: Nobody has the sole responsibility; I must take the view that the Cabinet Secretariat in the end is the one; if there is some question as to where the responsibility ought to be it is up to them to tell the people concerned.

I tried to do that when I was there.

In any event, I would hope that we can achieve more on that, but I am not too optimistic in believing that it is easy, because a lot of people have been looking for a way of demonstrating what is the right amount of R & D. A lot of very high-priced brains have gone into this and not very impressive answers have come out. That is on the general scale.

On the allocation of it I think our machinery is working better now; I think a good deal more effort is going in now to decide whether our R & D effort should go in this direction or not. I think the report I mentioned of the Science Council has given the government some general guidance on that.

One of the things I remember in many years past is the difficulty of getting scientists to criticize one another's programs. When I was at the Treasury Board, when I was at the Cabinet Office this was a perennial difficulty; we could not get a committee of scientists to say somebody was doing something that did not need to be done.

Through the Science Council and the Science Secretariat we are building up a system by which you can get a more critical appraisal by scientists of scientific programs. I think this is helping the government and I think that there have been some useful ideas come out in the Science Council reports on the direction of our effort.

Again it may be that our machinery can be made to work more effectively in this respect, as in others.

Senator Belisle: I have a supplementary question, Mr. Chairman, to Mr. Bryce: He has probably explained this partly, but I would like to know what is the position of the Department of Finance vis-à-vis the Treasury Board?

For example, I know the Department of National Revenue is in a sense a collecting agency; your job is to draft legislation that will produce revenue, but in your department once a department has made or has finalized its estimates is there somebody, a person or persons in your department that goes over these estimates before they go to Treasury Board?

For example, it may be possible, we have been told that it is happening that the Department of Agriculture may be making the same research as the Department of Forestry; is there somebody in your department looking at this?

Mr. Bryce: No, sir. We do look at certain spending proposals but, as I have indicated here, in the sentence which the Chairman read:

Broadly speaking, it may be said that the Treasury Board Department concentrates on managerial matters and departmental budgets, while the Department of Finance concentrates on economic matters and the government budget.

It is the proper function of the Treasury Board to see whether something should be done in this department or that department or if there is duplication or if there is poor management.

On the other hand, if some department is bringing forward a proposal for some kind of economic measure, let us say, for example, trying to get industry to locate in the areas of economic disparity...

The Chairman: My region in the lower St. Lawrence.

Mr. Bryce: That is right. We feel, and we exercise, a responsibility there to examine such a proposal and try to judge its economic impact and whether it is the most sensible way of achieving that objective.

Once the government has decided on it and approved it, scrutiny of how effectively it is being managed really falls on the Treasury Board. So this division of work of the Treasury Board is something which we are having to work out now, to develop as time goes on, bearing in mind that the Treasury Board used

to be part of the Department of Finance until two or three years ago and has now been separated under a separate minister.

We work as allies of the Treasury Board on most things and in a considerable degree of cooperation with them.

Dr. Davidson and later Mr. Reisman and I have all agreed right along that we want to be housed in the same building, we want to have access to the same papers, so that our staffs can cooperate readily and not put departments or others to needless duplication in dealing with two sets of people.

But essentially we would not try to scrutinize the execution of scientific programs or the removal of the duplication there. On the other hand, if the question arises whether Department X is putting too much effort into R & D in terms of its relative importance in the economy as compared with department Y, we would be prepared to try to formulate a view of that question.

Senator Belisle: But only at the request of the Treasury Board.

Mr. Bryce: That is right; or if it occurs to us we will tell the Treasury Board, but we will leave the working out of the decision to the Treasury Board unless the matter comes up in some other cabinet committee where we are asked to appear.

Senator Bourget: Coming back to that machinery that Senator Grosart was talking about, are you aware that in other countries they have that kind of similar organization that could do that kind of work, either in the United States, or Sweden, or the U.K.?

Mr. Bryce: Are you talking, sir, about deciding on the overall scale of the R & D budget, or on its direction?

Senator Bourget: The overall scale.

Mr. Bryce: Yes, I cannot say that I can recall now enough about them to compare them with our own. In the end though these are essentially questions of political priorities, political in a broad sense and we have got to get the decisions taken in a way that fits in with our own domestic internal government workings, so that the fact that there may be a different form of organization in another country would not influence me greatly on what our form is unless it was one that could be fitted in with ours.

We have, of course, developed in recent years two additions to the machinery here of real importance on this in the Economic Council and the Science Council, both of whom are giving the government advice publicly so that the public is quite able to see what advice the government is getting from these distinguished groups on this matter.

This makes it possible to have a much better public debate about the issues than heretofore.

The Chairman: If there are no other questions from other members of the committee I will go back to Senator Grosart and perhaps eventually to me.

Senator Grosart: Why do you not intervene now, Mr. Chairman?

The Chairman: It seems to me from what you have told us this morning that you have not had any continuing interest in the elaboration or implementation of either an overall science policy or science policies by sectors. This is not a criticism of the Department of Finance; other agencies may have that kind of responsibility, including the Treasury Board, but to come back to a more specific field, you say in your brief that you are a user of research mainly and, of course, that means that you are a user mainly of economic research.

Mr. Bryce: Right.

The Chairman: Where would that economic research be done within the government at the moment?

Mr. Bryce: A considerable part of it is done in the operating departments, who are carrying on the kind of programs we are involved in discussing from time to time. Let us say we are talking about the problem of the east coast fisheries.

The Fisheries Department will be, and again there is a question here whether this is really research, but they are studying the situation, getting the facts, trying to form an opinion as to what should be done.

In our discussion for the need of measures to deal with it and the way in which it ought to be dealt with we will, of course, draw a good deal of information, a good deal of analysis from them and then we will look at it and criticize it. This is an example of the kind.

Secondly, in some of our financial fields which the Chairman is familiar with we will

be using the research done in international agencies, the International Monetary Fund, the International Bank, various international committees, on the workings of the international financial system and the institutions in it.

We have had an outstanding example in the past few years of this in the development of the special drawing rights proposals in regard to the International Monetary Fund and this now, of course, has been before Parliament.

Mr. A. B. Hockin, Assistant Deputy Minister, Economic Analysis and Government Finance Branch, Department of Finance: It still is.

Mr. Bryce: It still is before Parliament and here we have used research done centrally and collectively internationally to which we have contributed. Sometimes I would get impatient with the numbers and seniority of the Canadian officials that were attending the meetings on this; I would say, Good heavens, we have so much to do at home; do you all have to go and talk about these things. This is another forum in a sense within the government.

We use in a number of fields the studies that are published by various government agencies, outstandingly of course the Bureau of Statistics; whether this is research or how it is judged, it is fundamentally important material on which we all rely.

We also use published studies by Manpower, Labour and groups like this.

The Chairman: But we have been told by Mr. Rasminsky that perhaps there was no great duplication within the federal government in the field of economic research, but that there might be quite important gaps.

On the other hand, we were also told that at some stage there was a kind of inter-departmental committee on socioeconomic research which was attempting apparently to look at that general situation in government as it was developing, but that this inter-departmental committee was not very successful in its exercise and recently it has been disbanded, so that we have no inter-departmental agency now within the government to look at the total picture of our effort in the field of economic research.

Mr. Bryce: Here you are talking of our national effort.

The Chairman: Within the government.

Mr. Bryce: In some of the fields in which we work, for example, in forecasting there is a good deal of inter-departmental or inter-agency work.

Mr. Hockin: That is certainly the case, Mr. Chairman; the agencies that are directly themselves involved in working in these areas are in constant touch with each other. I do not know how much time Frank Leacey, for example, just spends across the street in the Bank of Canada in the research department seeing what they are doing, talking to them about a very particular line of research.

It is true, for example, in the forecasting area with Trade and Commerce too, that the three agencies that do the work in this field have a great deal of constant liaison from the very top to the bottom of their organizations, from the newest recruit.

One of the first things we usually do with a new finance officer that we recruit is to take him to the other agencies to see what they are doing so that he will know what is going on there and he will know who to call about certain aspects.

There is another area which is perhaps a little more formalized, which is also very important; that is that for example DBS when it is thinking about developing a new area of analysis and research for the provision of statistics generally establishes an inter-departmental committee of both producers and users to make sure that when they go about this they are getting the views of all the agencies that would have an input or a use of the material.

Now, these tend to be rather specific committees, but any time there is something new this goes on.

I think between the two of them there is a great deal of liaison. Now, I should also perhaps add that it is not always our view that you should completely avoid duplication; there are some areas especially in this field...

The Chairman: No, I am much more worried about gaps than duplications.

Mr. Hockin: That is right, and as a matter of fact in some of these areas, for example, in the forecasting area when we took over the model from the Department of Trade and Commerce as it was then, I had a number of sessions with the responsible officers in the Department of Trade and Commerce at which we discussed the pros and cons of moving the model in this way, but throughout the basic approach was...

The Chairman: And by consequence moving the hidden report too.

Mr. Hockin: The basic approach we followed was that we did not want, whichever way the decision was taken, either agency to reduce its own input into the forecasting field, because we were unhappy at the idea of reducing the number of people who were working in the forecasting field, so that the government would not have to rely on one small group who were doing the forecasting for all its divisions in this area because it is unlike some of the efforts in research in the physical sciences where you cannot be just that sure of your results and you do not want the government to be in the position of having to rely on the judgment of just one or two individuals.

So that in these areas we have tended to say, let us have a bit of research, let us compare our results, let us work together, but let us go on doing so separately so that we will have something to check against.

Senator Yuzyk: Could we get an explanation of that model here and how it is associated with the econometric model of the Bank of Canada? Do you have cooperation here between these two institutions?

Senator Sullivan: That is what you are referring to on page 5, is it not?

Senator Yuzyk: Yes; at the top of page 5.

Mr. F. H. Leacey Head, Economic and Analysis Division, Department of Finance: The model which we have in the finance department is a model designed to forecast the gross national product, the employment rates, the unemployment rates, the price level; it helps to estimate government revenues and the government balances and the level of the foreign exchange reserves, these critical policy variables.

What is a model? It is really a mathematical description of the relationships that exist in the national accounts. I think the senators are familiar enough with the gross national product and the items of expenditure and income. If they want to go into that in more detail later I have an illustration I have twenty or thirty copies of this which I could give out if you want it later on.

What the model tries to do is to formalize these interrelationships for example, you know what a consumption function is; it is a relationship between consumption and

income. If your income goes up 10% this year you may not spend the whole of it this year, perhaps only 90% of that increase, and then the following year you seem to gradually catch up so that your savings are the same as before.

Senator Grosart: If you are a government you probably spend more.

Mr. Leacey: We have very good statistics on total consumer spending in Canada based on retail sales and consumer spending surveys. We have very good statistics on total incomes in Canada based on surveys of factories and establishments and government and so on.

So it is possible to build up a realistic picture of total consumption in Canada and total incomes in Canada. Then we subtract the taxes from the incomes, of course, to get disposable income. Here comes the consumption function now. We relate the disposable income, that is income after taxes, to consumption. The simplest possible relationship is to say consumption equals 90% of income; the mathematicians call this an equation C equals .9 of Y .

They develop similar equations for investment, fixed business capital formation in plant and equipment; the relationship I am using says that the change in last year's profits is related to the future change in this year's and next year's investment. There is a lag between the increases in profits and the increases in investment; that is another example of an equation.

Senator Yuzyk: It is based on data that you have been using for years, for quite a number of years; how far back do you go?

Mr. Leacey: Our model goes back to 1926, and it is called an annual real flow model. It is rather a fundamental and basic model. The bank's model is quarterly for the post-war period only and it is a more sensitive model and concentrates more on the financial effects on the economy. Our model concentrates more on the tax effects on the economy.

Senator Sullivan: You cannot rely on it alone, though, the model?

Mr. Leacey: No; as a matter of fact we rely on informed and considered judgment in the department. I advise Mr. Bryce on the results of the forecast but it is up to him and his boss to make the decision about the policy consequences of that advice. I try to keep my

advice as objective and scientific as possible and to avoid the policy implications so that they have an objective basis to go on.

Mr. Bryce: As between the model and what you call the considered judgment you use both?

Mr. Leacey: The models are new and there are still considerable possibilities of error in using a model. Therefore I am bringing the single equations from the econometric model into our traditional forecasting procedure one by one as single equations thoroughly tested and reliable. Then I bring them into our regular judgment forecast which is based on more traditional methods.

Senator Grosart: How sophisticated is your program input into this model?

Mr. Leacey: The input is called exogenous variables; these are amounts which we put in from outside the model system. Anything the model does with it is called an indogenous variable.

The exogenous variables that we put in consist of government spending; we regard this as something that is decided from outside the model. We take government expenditure in the budget forecast, for example, as given. Another exogenous variable is our exports to other countries in the world; we have to look very carefully at conditions in the United States, Japan, U.K. and our other customers and make an estimate outside the model of what our exports will be to those countries.

We have to take into account special factors such as the automotive agreement, which will change the level of exports.

So once we make our mind up about the increase in exports we then put that into the model. We also have an annual investment outlook survey; there was one of these surveys conducted last October jointly by the Economic Council and Trade and Commerce in which we have obtained the four and five year plans of the business enterprises.

There is a longer survey with a longer history which the DBS conducts which just asks for the annual forecast of businessmen of their fixed capital intentions.

So we can regard investment as exogenous in this case and we can take the information from the business community; they might tell us that investment will be up 9 per cent next year on the average, so we will put this 9 per cent into the model as another exogenous variable.

That is the list of these exogenous variables; government spending, export spending at all levels and the investment spending. Given these three exogenous variables or the main dynamic elements in the economy we can then put them into the model as data input and the model will calculate total incomes developed, total employment developed from that.

Then it will use this consumption function that I was talking about to estimate how much consumer spending will be out of this total income. It will give us other details, things that are important to us that we call the target variables: The unemployment rate has to be at a satisfactory level; the growth rate has to be at a satisfactory level; the price level has to be watched carefully; and, of course, the government balances and the exchange reserves.

With all of these target variables in mind then my bosses may decide to do something about fiscal or monetary policy to change the forecast that I have given them.

Senator Grosart: The point of my question really was how much scientific research is there behind these exogenous variables? Perhaps I could put it this way: What is the level of validity of our economic series compared to other countries?

The Chairman: The value of our data collection system?

Senator Grosart: What is the degree of validity of the economic series that we come up with from year to year; are they good compared with other countries?

Mr. Leacey: Yes; the accuracy of our past forecasts from year to year has been usually within one or two points of the actual increase in GNP.

For example, if we said we expected GNP to increase by 7 per cent, then the average error would be about plus or minus 1 per cent of that. In some years we have not been as good; in 1965 we underestimated the strength of the investment boom that was starting up that year.

For the last two or three years we have been very good; we have been right on almost to the last decimal in the past year.

Then again these big aggregates conceal some larger errors by components; these errors in the components tend to cancel each other out. The scientific basis for it has been developing over a very long period of time.

This Trade and Commerce model was first developed by Professor Klein in the Department of Trade and Commerce in 1946 or '47 and it developed over many years. Professor Klein is still working in the United States; he now has a very good model there. There is a giant model at the Brookings Institute in the United States.

What these models really represent is an effort to formulize the econometric relationships.

Mr. Hockin: May I add a word here Senator: The point I would like to make is that the input that has gone into it has, as Mr. Leacey says, started with the model that was first devised by Professor Klein and Professor Brown, who at that time was working in the government and is now at the University of Western Ontario.

Since that time it has been further developed by people working first of all in the Department of Trade and Commerce when it was there, and subsequently in the Department of Finance, in particular, Professor May, who is now on the Faculty of Carleton University.

We have our own staff of econometricians, who are continually revising the old equations which were used. They are testing them against subsequent experience to make sure that they are not getting out of date and adding to them as we try to articulate them in other areas where we think it has been deficient and where we want more detailed information.

This work is essentially carried on by our own staff, but we now have also an advisory group of consultants of the econometricians from the various universities in Canada chosen as individuals for their technical competence who look at our model periodically and make comments on it, suggesting further work that might be done, and criticism of certain equations that may be there.

This is the way that we attempt to put an input in in terms of our methodology in looking at it.

Senator Grosart: Could you look to this kind of model to do the job I was suggesting earlier, that is, to break down our total expenditures by cost benefit categories such as R & D?

Mr. Hockin: Not this model, no.

Mr. Bryce: We would have a hard time, Senator, to get the relationship between R &

D and the economic magnitudes for the reasons we spoke about earlier.

The Chairman: To come back to this problem, I remember that the Economic Council has suggested in their various reports that there were serious gaps in our economic research, and they were suggesting new institutes of research and so on. What is becoming of these recommendations of the Council? Are they totally unjustified, or are we acting on those?

Mr. Bryce: First of all, let me say about the Council, as I mentioned in the written paper here; we benefit very substantially from the research carried out by the Council and the reports and reviews of the Council itself. Occasionally they scold us for something we have done or have not done and sometimes we feel we deserve it; sometimes we differ with them.

However, I think there is no doubt that the Council has added greatly to the flow of useful research material to us as well as to others in Ottawa.

Now, I do not recall the particular places where they pinpoint gaps to which you refer.

The Chairman: In the third annual review; I think that they went back to this again in the fifth.

Mr. Bryce: Are you talking here of an outside organization?

The Chairman: Yes.

Mr. Bryce: On that we have had really one basic suggestion put to us by an outside organization and by several individuals on their behalf over a period of two years, or anyway all too long to follow up on that and I hope that we are going to see such an organization established.

I have tried to emphasize to those interested in it that the further it is from the government the better, because it will be dealing with forecasts, forecasting operations such as we make and the less collusion the better. We would appreciate having a separate expert judgment on this.

Similarly, it will be no doubt criticizing the government, criticizing the Department of Finance, not only for its forecasts but maybe for what it has done in the spheres in which we are interested. It is better that they should be distant from us.

As yet the government has taken no decision to support such an organization, partly

because of this doctrinal view that it is better that they get their support somewhere else if they can.

The amounts of money involved are not huge, part of the problem frankly is that the ministers responsible fear that it is going to be competing with the government and with others for experienced personnel.

This is one of the real resources that is needed to run such a thing, and there is a limited number of them. As I say, there has been no decision as yet to give such an organization support but that does not mean in any sense that the government rejects the value of such an organization.

The Chairman: So it is under active consideration?

Mr. Bryce: That is right; it is still under consideration. We have not included anything in the estimates for this year that have just been tabled.

The Chairman: But again, to come back to my earlier question, there is nobody really now within the government looking at the overall picture of economic research within the government, to see whether there are gaps, especially gaps, or whether there is the desired coordination.

For instance, we have been told by the Department of Labour research people that they never consult with the people in the Department of Immigration and Manpower in defining their research programs.

All this has been confirmed by the experts of the Department of Immigration and Manpower, although they are very, very close together at certain boundary lines.

Mr. Bryce: As I remember, the functions of the old Department of Labour relating to manpower were supposed to be taken over to the new Department of Manpower so there should not necessarily be that degree of need that you imply.

I think it is probably fair to say that there is not at present an organized review of the various economic research functions of the government seeking to establish gaps. Most of us that are working on it in this town know one another and are aware broadly of what has to be done.

There have been gaps in basic data, as well as research. I mention in here how we welcome the fact that the Bureau of Statistics is going to produce input-output tables that we will use and flow of funds tables that we

will use. That is the sort of gap that has existed but, of course, it takes manpower, scarce manpower to produce that sort of thing.

Similarly, on the research side it takes scarce manpower to produce it.

But I think it is fair to say there is not a systematic exploration for discovery of gaps that goes on from year to year.

The Chairman: And manpower training programs, because we were told also by the Public Service Commission when Mr. Carson was before us that the day he was before us he had received from various government departments a total demand for 400 economists and that he did not see where he could find them. That is one assertion that has been made before us.

Last week we saw the people from Central Mortgage and some of the tables they presented before us showed that they had lost about 45% of their personnel in the field of economic research last year to other federal government departments so that now they have only about 20 people looking after the whole problem of urban planning and the housing situation and so on.

So who is looking after this apparent crisis, or this apparent lack of economists in Canada while apparently we may develop a surplus of Ph.D physicists and engineers?

Mr. Bryce: The situation is improving very markedly in regard to graduates. We are finding, I think it is fair to say Mr. Leacey, a good supply now of both immediate graduates and graduates with some post-graduate training. I think I refer to this in the notes here and we have been getting in the Department of Finance good people, but they are not experienced and it takes some years before they can assume the kind of responsibility that we would like to be able to get men to assume.

The real trouble is that there were not enough economists educated ten or twenty years ago. I would not attribute that in any way to the deficiencies of those who were teaching economics ten or twenty years ago, but in any event that is where the deficiency was.

The Chairman: I was not teaching at that time.

Mr. Bryce: We just cannot invent them. We have imported a good number, as you can see from the tables here on our personnel.

We have on our staff a good many people who were born outside of Canada. To look at the numbers here at the bachelor level, out of 74 we have only 58 born in Canada and we recruited people from a variety of places.

Again, if you look at people with Masters and Doctors degrees we got men who were born and educated in other countries.

We have supplemented our resources, but I think the fact of the matter is that there is a shortage, there is a shortage of experienced economists in the country and we are remedying it by recruiting and training and upgrading the younger ones as fast as we can do so. That still does not produce us relatively mature men to whom we can delegate problems and on whose judgment we will feel we can rely.

One of the terrible problems in a department like ours is to know how far you have got to check and review the work of subordinate officers. This is one reason why our senior officers are very overworked, because as we have a higher than normal proportion of younger people now they require more direction; their work requires more review and our overall effort is limited by the number of experienced people that we have available.

This is part of the problem and, of course, it is in part related to the size and growth of the universities, because these are now together with the provincial governments the main competitors for experienced economists.

I have also felt that now the provinces have a very good claim on competent economists, because they have a very real need for them in their work.

The universities are a different matter; the question of the scale on which the universities are expanding is, of course, a national issue in its overall magnitude, but it is one on which the government here and Parliament took action in 1966 or '67.

We have got a five year program under way now in which we are supporting the provinces; the universities are still expanding enormously rapidly and as was evident at the time this was decided on, one of the great bottlenecks in that expansion, one of the great problems has been the supply of staff for the universities.

That has inevitably had to compete with the current use elsewhere of people of the same education and the same age groups as the universities want. The universities too have a much higher proportion than usual, as

I recall, of younger people, particularly in the economics faculties.

Here we have been ploughing some of the scarce resources of economists back into university teaching so as to improve the situation currently, five years from now and ten years from now.

Senator Yuzyk: But it is paying off, is it?

Mr. Bryce: Yes.

Senator Yuzyk: Do you keep a liaison with the various departments?

Mr. Bryce: Yes.

Senator Yuzyk: And the various universities?

Mr. Bryce: That is right; we go there seeking young men.

Senator Yuzyk: And the students are aware of the fact that they have excellent opportunities in the government?

Mr. Bryce: Yes. Perhaps Mr. Hockin might say a word about our summer student program.

Mr. Hockin: We have tried, Senator, to really get in on the ground level by recruiting, not a large number, because of the reasons Mr. Bryce has mentioned. A number of senior and graduate students each, who will come in and work in areas which are related to their own areas of academic interest and work under the direction of experienced people, either in research oriented subjects which are both related to what we need as a user and to what they are interested in doing as students and at the same time to mix in with it some of the practical problems which face a government department such as ours in making recommendations to their minister.

We try to make sure that we give them lots of staff time so that they will be able to profit from their experience. We let them see what it is like to work in the government at that stage and hope that they will be so impressed with their experience that as they finish their courses they will be interested in coming back as permanent staff members or staff members for a number of years, perhaps as part of the overall job experience that they will try to collect.

I think we have been very successful in this; the impression we have in talking to the Public Service Commission, for example, is that the students that have had that experi-

ence in the Department of Finance have been good advocates to their friends of the worthwhileness of getting experience in the department because they felt that they had been used well, that they had got good experience and that they therefore are well disposed either to coming back themselves and working in the department or to sending their friends along to us at subsequent times. We have had some very good students.

Senator Yuzyk: I notice that your maximum was in 1966, when you had 22 students. Do you set the numbers that are employed, or is this according to application?

The Chairman: They have to seek the approval of the Treasury Board.

Mr. Bryce: We have to accommodate it within our budget and manpower limits, and since 1966 we have added significantly, as you will see from one of the other tables, to our number of permanent officers. So that that year we were not under quite such a reign of austerity as presently, but meanwhile our regular staff has grown. We cannot give proper attention to more than 15 or 20.

Senator Yuzyk: This is what I wanted to know and this summer, 1969, are you planning to increase this number of employment of summer students?

Mr. Bryce: I should be able to answer that question but I am afraid I cannot tell you.

Senator Yuzyk: For instance, take this figure of 22 in 1966; has your department since 1966 hired some of these students, I don't know how advanced they are, as officers in your department?

Mr. Bryce: We certainly have hired a number of those who were formerly with us during the summer. I would be hard put to it right off the bat to tie them in with the 1966 group, but we have hired quite a number of good young men.

Senator Yuzyk: I would think though that you should try to increase the number of summer students, because in the end the more you have the greater proportion will be employed.

Mr. Bryce: Yes.

Senator Bourget: Has the department any grant system of subsidies to help those students to go on post-graduate courses?

Mr. Bryce: We have as described here, sir, on pages 13 and 14 in the English, our training inside the department and the fact that we send some men off on educational leave to improve their qualifications. We have got to do this with care because a lot of our men come to us having financed themselves or got other funds for their post-graduate work and we cannot discriminate unreasonably, but we have sent a number off on educational leave.

We have also in the last two years had a sort of visiting professor, with us. First, Professor Renaud of the University of Montreal and currently Professor Bonin of the University of Montreal, and I hope we are going to have one next year.

Senator Kinneear: About how many universities are represented by these students?

Mr. Bryce: I would have thought about half a dozen probably; we tend to get a fair number from the main universities.

Senator Kinneear: Montreal, Queens and Toronto, say?

Mr. Bryce: And Laval; we have done well from Laval.

Senator Yuzyk: How about the west? Are there some coming in from the west?

Mr. Leacey: Manitoba and British Columbia. Some of them go to post-graduate work outside the country and then come back.

The Chairman: All the senior officers come from the west.

Senator Grosart: On the bottom of page 6, you say you agree with the evidence we had from the Bank of Canada and the Economic Council about:

...the importance of improving the statistical base upon which our economic analysis rests.

Would you tell us what is being done about this and who is doing it?

I ask the question because we are a science policy committee and this would seem to be a major priority in science policy in the economic area at the moment.

Mr. Bryce: On that, sir, you have had a big brief from the Bureau of Statistics which I have read and they give a number of instances of programs that they are inaugurating. I think you will see in the estimates for 1969-1970, that they have been given by

the government more funds; they have been given a larger increase in funds. I hesitate to say than in recent years, but I think it is reasonable to say that the Treasury Board has taken a pretty understanding attitude towards the Bureau in the past year and in dealing with next year's program.

That would be a better question perhaps to address to Simon Reisman.

Senator Grosart: But your reference here is more specifically to the DBS figures.

Mr. Bryce: That is right.

Senator Grosart: What about the other statistical bases other than those produced in the DBS series?

Mr. Bryce: The Bank of Canada produces some of the financial figures, not nearly the volume that the DBS does. The Bank keeps improving its series as part of its regular process.

Senator Grosart: Nobody is doing a science series.

On page 12 of the brief I am very happy to see that Mr. Bryce suggests something that we could be doing ourselves about this, referring to paragraph 17 on page 11, where I read:

Whether or not these and similar Royal Commissions...

The Reference is to Glassco, Carter and so on:

...constitute the best way of undertaking research in the social sciences and on public policy is a matter which this committee, or another, might well study.

You suggest here, as I understand it, that the Royal Commission may not be—or perhaps I should put it this way—that we may be putting too much reliance on Royal commissions?

Mr. Bryce: This is a feeling I have had. It is basically a personal feeling and it has been based on talking to a number of those who have served on such royal commissions or served as the directors of research, secretaries, and so on.

They have to organize their research quickly, they have to superimpose it on other commitments of the kind of people they want to get, they have to try to direct the research to the purposes of the commissions. In fact, the research may take longer than the work of the commission itself.

We have spent tens of millions of dollars on research through this channel and it seems to me that it would be worth while for this committee or some other committee to talk with some of those who have directed it, to some of the members of these commissions, those who have served on the commissions, and try to make an assessment. Undoubtedly, this has been the chief way in which we have had research carried out in the social sciences in Canada in the past 25 years.

The Chairman: Is not the number of royal commissions we have had in these various fields a reflection of the shortcomings of economic research within the Government?

Mr. Bryce: There are two aspects of that.

Senator Grosart: It could be the opposite, of course.

Mr. Bryce: There are two aspects to be considered in answering that question. If there had been better continuing arrangements for doing research and publishing the results, would the Government have set up fewer royal commissions? I am not sure that the answer to that is yes. Indeed, if you look back to the British model, the role of the royal commission there is not to do research but to call witnesses, get their views, have four or five or a dozen wise men sit down and discuss it in an objective way.

The Chairman: Yet their main budget is in the field of research.

Mr. Bryce: I was going to say that the Canadian model of royal commission has been different and has been very research oriented. I would not say the research activities have been almost pre-eminent, but they have been of equal importance as the deliberations and hearings of the commissions themselves. This has been, therefore, largely a Canadian institution not entirely in accordance with the earlier traditions of royal commissions.

Is it a good way to get research done? I would have thought the accumulation of material brought out by the Economic Council, for example, would reduce the need for a royal commission to do this. On the other hand, the tradition has become so strong that it would seem to me a worth while project to examine whether these efforts have really been successful, whether the quality of the work done, whether the relevance to the work of the commission in both nature and time, was such as to make it valuable for the purpose of the commission, and also whether

it has made it valuable for the purpose of general scholarship and other research in the country, because an enormous amount of literature has been produced out of all this.

Senator Grosart: Of course, governments do not always want royal commissions to report too soon.

Mr. Bryce: That is right, but there is a degree in all this.

Senator Grosart: You spoke about a Cabinet committee on priorities. Does that committee have its own secretariat? Does it do any research of its own, or does it do any direct science research?

Mr. Bryce: It is of course served by the Privy Council office and the Cabinet office. The Science Secretariat is there and I should not discuss their role. It would be better if you got someone from the Cabinet office to do that, but it does not have a big organization of its own. It has a secretariat. The Cabinet secretariat serves it. The Science Secretariat is available to it and produces material for it from time to time.

Senator Grosart: But, structurally, would the Science Secretariat have a mandate, a legislative or order in council mandate to serve any such committee or is it confined to the very interesting CPCSIR, the Committee of the Privy Council for Scientific and Industrial Research, which somebody said met seven times in 10 years.

Mr. Bryce: The Cabinet, Secretariat and the Science Secretariat, as I understand, can serve whatever group or Cabinet committee the Prime Minister or the President of the Privy Council or Secretary of the Cabinet wants it to serve. The Science Secretariat has developed since I was Secretary of the Cabinet. I do not know enough directly about it.

The Chairman: They are part of the general operation.

Mr. Bryce: They are part of the operation, that is right.

Senator Grosart: Would you care to answer this question? I will understand if you do not. Does the Cabinet Committee on Priorities meet regularly or only in crises?

Mr. Bryce: Regularly, sir.

The Chairman: To come back to an earlier question, I am still intrigued about the man-

power situation in so far as economists and social scientists are concerned. You have answered my earlier question. I think Mr. Hockin was dealing with it mainly. In terms of the Department of Finance, as there been a study made of the federal financial contribution to manpower developing or training programs in universities in the field of the social and economic sciences as compared with what we are doing for, let us say, the physical sciences?

Mr. Bryce: I think, sir, there is no doubt—let me first say that. The federal Government has in recent years been giving quite substantial support to the universities generally through the post-secondary educational arrangements. I was one of those who worked that out and I feel that on the whole it was really a massive program at a time when we assessed that the country was being confronted with a really major problem. Now, the other way that we give some support, and what I assume you are referring to here, is through the support of research projects or of individual post-graduate scholars and I think it is fair to say that...

The Chairman: Graduates college.

Mr. Bryce: Sorry, that is right, but scholars in post-graduate work. I need hardly say this to you, but we have not been as forthcoming with funds and volume as we have been in the physical sciences. This is a long story I suppose as to why not, but the figures are publicly available. You might have them in your records here. Well, why not? Partly because the physical sciences have a long tradition in this regard. We have been in this business for a long time. Secondly, I think there is a greater, more widespread recognition of the ultimate value of the research done in the physical sciences and technological work.

The Chairman: At least we have more faith.

Mr. Bryce: More faith. I think it is fair to say that governments, until 10 years ago, have been a bit reluctant to get into the support of work in the social sciences, where you get into much more controversial issues. When you are supporting studies on a lot of things in social sciences, they are often involved in issues of policy concerning Government policy and I know through the fifties there was a general feeling that it was better to keep away. Well, research in the social sciences and especially the development of computers

has become a much more expensive business and there is a whole lot more of it. I think it is fair to say that there is now a much greater demand for this, to which we have responded only in part. This is another area where we really need a little more work done centrally within the Government to assess the potential value to the country, and to the Government, of research in the social sciences and the methods and channels of its support. One of the major studies done for the Science Council and Canada Council jointly will shortly be coming out—in a few months, I suppose.

The Chairman: In a few months?

Senator Grosart: The Macdonald Report.

The Chairman: In March.

Mr. Bryce: All right. These mills grind rather slowly, in our experience.

Senator Grosart: It will come out before ours, Mr. Chairman.

Mr. Bryce: From there we may get a greater knowledge. I would like to see the department able to devote more manpower itself to the study of the role of university social science research in Canada, its value and so on. It is one of those things to which we have not given enough priority as yet. We have not got enough really good staff to put on it as yet, to feel we could make an effective contribution.

The Chairman: Do you not think that it would be perhaps a good thing to revive this interdepartmental committee on socio-economic research. I do not know—perhaps it is confidential—why it was set up originally. I do not know why it was abandoned. There may be some justification—quite apart from the experience, which might have been not a good one, as to the first exercise.

Mr. Bryce: I think that it really was a series of meetings rather than a highly structured body which was created. We did have a

series of meetings on the subject and with the growing pressure on budgets in the last eighteen months there really was not enough money available to warrant a committee figuring out new ways of spending money.

Senator Grosart: Mr. Bryce, would you say that one of the reasons why we appeared in Canada to place more reliance on *co-ordination* of research between departments and Crown agencies, than on *control*, might be that, unlike other countries, we have perhaps a greater concentration of senior personnel in Ottawa?

Mr. Bryce: A greater concentration?

Senator Grosart: Of senior personnel.

Mr. Bryce: Of the total country's senior personnel, or the Government's?

Senator Grosart: I mean the Government's?

Mr. Bryce: Yes, I guess that is true, sir. That is true. I hesitate over it, because I am not sure that it is as true in the physical and technical sciences as in the social field. Some of the other work is in laboratories across the country, but I suppose that is the case.

Senator Grosart: I said that because one seems always to see the same people at the cocktail parties.

The Chairman: Do you have any other questions?

Senator Grosart: No.

The Chairman: Honourable senators, we might end at this stage, but before doing so I would like to thank Mr. Bryce and his colleagues very much for coming before us this morning and for pointing out some gaps in our effort.

Mr. Bryce: Thank you, Mr. Chairman.

The committee adjourned.

APPENDIX "35"

STATEMENT BY THE
DEPUTY MINISTER OF FINANCE
FOR THE SPECIAL COMMITTEE OF
THE SENATE ON SCIENCE POLICY

March 1, 1969

Mr. Chairman and other Honourable Senators:

1. I appear before your Committee in response to your reiterated personal request even though I do not regard the analytical work of the Department of Finance as research, in the sense you are using the term, and I do not presume to be an expert on the government's science policy. I am pleased to tell you something about the department, its objectives, operations and requirements and to answer your questions as best I can. The department is a substantial user of the results of research carried on by others, and endeavors to apply information and analysis to its primary task of assisting the government to reach financial and other economic decisions. Perhaps some of our work falls within your concept of development, though your definition does not seem designed to cover it.

2. The department has no general statutory definition of its duties, and wields little direct authority over anything except a few special programs which it carries out, such as grants to provinces and municipalities and some guaranteed loan programs. Its essential functions are to assist and advise the Minister and the government on a variety of actions which have significant effects upon the economy and upon the over-all program of the government.

3. This year for the first time we have had to place before Parliament, in the new form of the Estimates, a definition of the Program Objectives of the department. They are brief and read as follows:

"The primary objective of the Department of Finance is to assist the Minister and the Government to decide upon and implement financial and other economic policies and measures that will best accomplish the major economic and other objectives of the government.

In support of this main objective the Department:

(a) analyzes and appraises the economic situation and prospects in Canada and in other countries of interest to Canada;

(b) considers and advises the Minister and the Government upon fiscal and other economic policies and measures, including those proposed by other departments and agencies of government, as well as tax and tariff and other proposals originating in the department;

(c) studies the fiscal position of the Government of Canada and recommends specific measures to meet the requirements of the Government within appropriate fiscal policies, by action in regard to expenditure, lending, taxation, borrowing and cash management;

(d) assists and advises the Minister in regard to matters concerning the balance of payments, exchange reserves, international monetary and financial arrangements, coinage and other related subjects;

(e) participates in international negotiations and other meetings relating to trade, finance, taxation, economic development and other economic subjects;

(f) studies the fiscal position of provincial governments, advises on policies relating to federal-provincial fiscal and economic relations, carries on discussions with provincial authorities and pays grants to provincial governments and grants in lieu of taxes to municipalities;

(g) administers various statutes relating to guaranteed loans, the capital budgets and financing of Crown Corporations and Agencies and makes contributions to international financial institutions."

4. In carrying out these objectives the department is organized into some 13 divi-

sions, each of which is a small group of up to about a dozen officers with a Director in charge. These divisions are grouped under three Assistant Deputy Ministers, and a Senior Tax Adviser. In addition, we have a fairly substantial support staff providing various services—including a library, several registries, clerical and stenographic services and personnel and other administrative services. This serves the Treasury Board Department as well as Finance. Beyond this we have the Mint attached to the department, but shortly to become a Crown company under the Minister of Services and Supply. An outline organization chart of the department is attached to the text of this statement, and some tables of personnel statistics.

5. I will not endeavor to describe initially the roles of the various divisions of the department. If the members of the Committee wish to go into them I would be glad to respond to questions. I would like to emphasize that over the years the department has endeavored to avoid detailed operational responsibilities, or to transfer them to others, in order that it can concentrate on the central analytical and policy work that is described in its program objectives above. As a result, while we recommend the content of tax laws and the tariff to the government, the Department of National Revenue administers them. While we recommend the various public debt operations to the Minister and the government, the Bank of Canada carries them out as our fiscal agent, and gives us very good advice as well. Shortly the Mint will make the coinage to our order; we shall simply buy it and sell it through the banking system. Experience has shown successive Ministers of Finance, and their Deputies, that the pressure of urgent work on policy issues and major decisions tends to crowd out proper attention to the management of operations.

6. In discharging its central role, the department has to take into account a wide variety of economic and other information, analyze it and bring it to bear on the various issues confronting the Minister and the government, in the light of our knowledge of government policies, and endeavor to reach sensible decisions as to what should be done. This applies not only to major issues of fiscal policy, for example, but also to the many specific problems and proposals in financial and economic fields coming before the Cabinet, the Treasury Board and various Cabinet Committees from week to week. In addition

we have to deal with a variety of other departmental or interdepartmental or international actions in financial, trade and other economic fields where officials operate within general lines of policy laid down by Ministers.

7. In carrying on this work the department must have men—or women—with knowledge, education, training and experience. Most of all we need people with intelligence and good judgment, and the ability to express themselves. Some of them must be good negotiators. We rarely have time to do research in the scientific or academic sense of that term—but our officers are expected to know where and how to draw upon and apply the results of research done by others, not only in other parts of the public service, and elsewhere in Canada, but in other countries as well. I wish we had more time to do this in greater depth, and indeed ultimately to carry on some research within each of our divisions, but we have had to operate under pressure for years now and have had to give priority to urgent tasks from week to week.

8. In addition to knowledge our officers in many cases require the technical capacity to apply modern methods of analysis to our problems. This is perhaps best exemplified in our macroeconomic analysis of the economy, for the purpose of forecasting and of assessing the probable effects of various fiscal or other economic measures. Here we now benefit from direct access to a large computer in which is stored a very large number of series of economic statistics, which our officers can consult and analyze very quickly and easily. This has already been described to the Committee by the Bank of Canada. We also maintain and develop and use for our analytical work a mathematical model of the Canadian economy. The original version of this model was worked out twenty odd years ago in the Department of Reconstruction and then transferred to the Department of Trade and Commerce, where further work was done on it. We took it over in 1964 and have done considerable further work on it since that time. Details of it were published several years ago. If the Committee is interested, Mr. Leacy of the department will be glad to answer questions about it. I wish only to cite it as an example of one kind of analytical instrument we must use in our work—for which we claim no intellectual originality, as many other people use models for similar work elsewhere. I might add that we never rely upon the model

alone for our answers but rather use it to check our more conventional methods of economic analysis and judgment. The development and use of a model of this kind has the further advantage of requiring our officers to put their analysis at some stage into precise and consistent form, particularly in connection with complicated relationships where secondary and tertiary or even further effects may have to be taken into account. In the end of course we must recognize that we do not know and cannot put into figures the precise working of the complex economic system in which we work, and we must allow as best we can for uncertainty and for various influences we cannot measure.

9. Other fields of our work do not lend themselves so readily to modern quantitative analysis, but we endeavor to apply just as serious efforts at analysis and appraisal. In the field of tax policy we have devoted a great deal of effort to the analysis and appraisal of our current tax system and the proposals for changes in it. These include both the proposals of the Royal Commission on Taxation and those we have received from others. We have developed numerous proposals for consideration by our Minister. Much of this work has to be done by experts who understand not only the tax system but how people and businesses react to it. In calculating the revenue effects of possible tax changes we use, along with other information, a model of the taxpaying population organized for us by the Department of National Revenue in their huge computer and based upon a sample of 100,000 1967 tax returns. In forecasting the potential effects of tax proposals on the capital markets and related flows of capital we have studied with care some quantitative analysis of the Carter proposals done by the staff of the Commission and others and we arranged to have some further studies made by the Institute for the Quantitative Analysis of Social and Economic Policy, at the University of Toronto, which we have made publicly available to others interested.

10. We hope this year to be able to apply to our work in the department—and thus to the analysis of issues before the government—two of the new major statistical productions reported to your Committee by the Dominion Bureau of Statistics. One of these—the new input-output tables and related studies—we hope to use in our work on economic development analysis and in work on trade subjects. The other which we have asked the Bureau to

undertake is the set of financial flow accounts. We expect these will help us in our work on subjects relating to the capital market, including not only questions relating to our own borrowing and lending and foreign exchange operations but also questions concerning financial institutions and legislation bearing upon them. I might add that this is a good illustration of the importance we see in the work of the Bureau of Statistics, and I should like to support what the Bank of Canada and the Economic Council have said in their briefs to your Committee about the importance of improving the statistical base upon which our economic analysis rests.

11. A great deal of our work depends upon information about specific industries and the trade in specific products. This is of course most obviously the case in regard to tariffs and trade negotiations and arrangements. In these fields our officers must look to a wide variety of sources of information. Some of it of course comes directly from those affected by our decisions. Our officers have to understand not only the principles of international trade theory—but also the highly important institutional structure in which production and trade is now carried on—as well as the complex of laws and trade agreements affecting it. We are assisted in this part of our work by the reports of the Tariff Board to which are referred subjects requiring considerable investigation and research. We have also been assisted by the increasing amount of outside research work being produced now in Canada, and we hope to see more of it carried to the stage of studies of particular industries and their structure and behavior. Within the public service the creation and growth of the Department of Industry has made available to us a large and valuable source of detailed information and knowledge, supplementing that already provided by the Department of Trade and Commerce and other departments such as Agriculture and Fisheries. In this field of trade there is a well established tradition in Ottawa of consultation and co-operation between departments, but we must in the end be in a position to assist the Minister of Finance with considered and informed support on matters for which he is primarily responsible to Cabinet and to Parliament. Those of you who have had occasion to study in detail the work of the department, and particularly of Mr. Rodney Grey, on the new anti-dumping code and the legislation to implement it will be aware of the complexity

and quality of the department's work in this field.

12. Another example of the nature and quality of the work of the department with which Parliament has dealt is to be found in the system of equalization grants to the provinces, paid in accordance with the Federal-Provincial Fiscal Arrangements Act and the complex regulations made under it. Here the government was confronted with a problem of great importance and great controversy. As a result of considerable study of the principles involved and various possibilities, and the practices of other countries, we were able to produce an objective, logical formula, simple in essence but very difficult and complicated in application. This has, I suggest, won a very wide measure of agreement in Canada. It is the kind of result we would like to produce more often, insofar as the country can afford it.

13. The work I have mentioned and illustrated so far relates to matters which we initiate ourselves. Much of our work, however, is more of the nature of the work of the opposition in Parliament in that it involves a critical appraisal of the proposals of others. The government considers from week to week various proposals put forward by individual Ministers, departments or agencies, or groups of them in consultation. These proposals must be analyzed, appraised, tested against a general framework of policy, reconciled with our constitutional powers and responsibilities, and finally fitted into a budget and financial program. The main groups that engage in this critical appraisal are the staff of the Treasury Board, the staff of the Cabinet Office, and the Department of Finance. The delineation of responsibilities for this work of analysis, appraisal and criticism is nowhere laid down clearly and precisely, particularly since the Treasury Board staff has been split off from the rest of the Department of Finance. Broadly speaking, it may be said that the Treasury Board Department concentrates on managerial matters and departmental budgets while the Department of Finance concentrates on economic matters and the government budget. In any event our main role is to analyze and appraise the economic proposals that are brought forward and to help the government to decide whether these should be accepted, modified, deferred or rejected. In this work we have to use all the information and critical judgment we can muster and carry on considerable discussion with those

putting forward the proposals and others examining them. This work is all too frequently done under considerable pressure of time and urgency.

14. In the several roles that I have described, the department must bring to bear not only particular economic considerations for which we have to rely on people with special knowledge and techniques, but also an integrating role that takes into account a wide variety of considerations, social and political and sometimes technical and legal as well as purely economic. Moreover, proposals, whether our own or others', must be judged in relation to government policies and programs as a whole and some conclusion regarding priorities reached. Merely because an idea is a good one or its purpose is desirable is not sufficient to warrant the government implementing it. Relative values, and cost in relation to the cost of other things, all have to be judged, as well as whether or not the matter is something which properly falls within the responsibilities of the federal government rather than a province, or, for that matter, within the private sector.

15. It can be seen from this description that it would be difficult to define research roles for officers or even divisions within the department which would cover all the considerations we must endeavor to bring into account. It is for this reason that we need to have, as I have said, officers with intelligence, a good education, experience, common sense and good judgment who can turn their attention quickly and effectively from one aspect of a problem to another, drawing upon sources of information as required and applying the results of research as well as knowledge of government. We intend, in our own specialized fields of economic analysis, taxation, capital markets and public finance generally, to develop a larger group of specialists with the time and education to keep fully abreast of work being done by others both in Canada and elsewhere. We plan, as such officers become available, to do enough original research work in the department to attract and retain first-rate economists who will be able to understand and appraise what others are doing as well as to contribute themselves to the solution of the problems confronting us. However, it would be out of the question for us to do enough research to meet the needs for information and expertise which we require for the wide range of mat-

ters on which we have to focus attention from time to time.

16. The department has over the years initiated with the government a number of major projects of inquiry, research and report through the medium of royal commissions. This has been the major form in which research in the social sciences and related public policy questions have been carried on in Canada in the past several decades. The first example that I would cite is the Rowell-Sirois Commission which brought together the work of many distinguished Canadian scholars in the late '30s and produced a report and series of research studies which have been recognized as one of the great milestones of Canadian public inquiries. While its specific proposals were not implemented, its work has illuminated much of what has been debated and accomplished in the past 25 years. A second project of this nature initiated in the department was the Royal Commission on Canada's Economic Prospects. Again a considerable number of scholars from outside and inside the public service were engaged on thorough investigation and research for the commission, which has been of great value both to us in the public service and to others. A third such project initiated by the department was the Royal Commission on Banking and Finance, the results of which, both in terms of research and report, have been utilized in preparing legislation to place before Parliament in recent years. Two further major inquiries have been initiated by the government to deal with central matters in the department's field of responsibility. One was the Glassco Commission on Government Organization and the other was the Carter Commission on Taxation. Both of these major commissions carried on a great deal of research, some of which was immediately utilized by the commission in preparing its report but all of which represents a serious and concerted effort to apply research techniques to the major problems confronting us. The Carter Commission particularly produced a vast literature of research studies as well as the monumental report itself, which has been recognized far and wide as a most distinguished contribution to the literature on the subject, despite the inevitable controversy over its proposals.

17. Whether or not these and similar royal commissions constitute the best way of under-

taking research in the social sciences and on public policy is a matter which this Committee, or another, might well study. I have had some doubts whether it is the most effective way of doing research because of the way in which the inquiries have to be organized and the pressure of time under which some of them have felt they must work. In any event this research, under the auspices of royal commissions, has been the chief form in which research has been initiated and financed by the government in the subjects in which the Department of Finance is most involved.

18. I need hardly remind you Mr. Chairman that in 1963 the new Government and new Parliament established the Economic Council of Canada in order to produce more research into our economic problems on a systematic and continuing basis. In addition of course the Council renders its collective judgment on the results of this research and its application to many of the economic problems confronting Canada. The Council deals with the government at arm's length on these matters, giving us their reports in published form, so that the results of their research and the advice that they tender are available for all to see as well as the government. We in the Department of Finance of course make extensive use of the work of the Council and its published research reports. We take to heart what the Council recommends even though we do not always wholly agree with it. We feel that a body organized as is the Council, and free from the day to day pressures of having to reach decisions, is much better able to undertake a lot of research of this character than is our department.

Personnel

19. Your Committee has asked those appearing before it for some specific information relating to personnel and personnel policies. In view of the nature of the department and its work as I have described it, I am not sure just how far you would wish to have information about our staff. We do not have any one particular research division, and the information I give will relate to the department as a whole. Statistical tables are attached to this text.

20. Over 75 percent of the officers in the department have one or more degrees, 50 percent of the officers are 34 years of age or under and the proportion of recent university graduates on strength in the department is

high. The continuing policy of the department now is to recruit young graduates with studies beyond the Bachelor degree level. Considerable effort is made to ensure that we enroll officers who show high potential for advancement to senior levels. While we prefer to recruit men or women who have graduated in economics or other social sciences, our chief interest is to get first-rate, intelligent people with the qualities of mind and personality we need for our work.

21. Recruiting is accomplished primarily through programs conducted by the Public Service Commission. The Socio-Economic and Administrative Trainee Programs direct an increasing number of high-calibre graduates to the department. In conjunction with recruiting efforts conducted formally through the Commission, numerous informal contacts are maintained with universities and other likely sources in an attempt to identify individuals with high potential who might be interested in a career with the Department of Finance. The department is also actively engaged in a summer employment program which permits students engaged in post-graduate work to gain first hand, on-the-job experience. Some of these graduate-assistants normally apply for permanent employment with the department upon final graduation.

22. The criteria upon which the hiring of professional staff is based involve evaluations of academic performance, recommendations from university professors and others, relevant work experience, and impressions gleaned from interviews as to the ability of the individual to participate in the work of the department as described above.

23. The continued development of officers within the department is encouraged through a periodic system of evaluation and appraisal of performance on which recommendations for courses, training, salary increases and promotions are based.

24. All departmental employees are encouraged to increase their knowledge and skills through a variety of courses offered by private institutions, universities and the Public Service Commission. Financial support is given to those involved in programs of study through partial reimbursement of tuition fees, time off from work to permit course attendance and allowances to defray the cost of course materials. Full time educational leave,

with an allowance to cover living expenses etc., has been and will be granted to those employees whom the department feels it is in its best interest to support toward the attainment of higher qualifications. Over the past two years approximately 10 percent of the staff have attended language training courses.

25. In addition, seminars are conducted from time to time within the department to enable employees to keep up to date with recent developments in their area of interest and expertise, to become acquainted with new concepts and techniques and also to keep abreast of the important activities of other divisions of the department.

26. The department has a high ratio of senior officers to junior officers because of the nature of our work and responsibilities, and our relationships with other departments, agencies and governments. Many of our senior and middle rank officers go to work in other departments of the public service, usually in higher paid positions, and we in turn recruit officers from elsewhere in the service. Like other departments we have real difficulty in finding experienced and well trained economists and statisticians. There is an over-all shortage of such people in Canada. There must still be scores, if not hundreds, of vacancies for such people in Ottawa and new positions for such work granted by the Treasury Board are essentially hunting licenses—and much of the hunting is done within the public service itself. Our work suffers from this shortage as does that of others. The supply of young graduates, including some with post-graduate training, is now much better and we are trying to readjust our working arrangements to use more young, well trained persons in place of experienced economists, but in our kind of work it is difficult to carry this substitution very far.

27. It is these limitations on the numbers of experienced men and women able and available to do the kind of work we do, rather than money or policy, that mainly determines how much we can do and how well we can do it. As time goes on we expect to have enough highly qualified officers to do a better job of bringing to bear on government economic policies more of the growing amount of research work being done in the social sciences in Canada and elsewhere.

Special Committee

PERSONNEL STATISTICS—DEPARTMENT OF FINANCE (Jan. 31, 1969)

Establishment positions.....	391
Frozen positions.....	23
Positions available.....	368
Establishment strength.....	339
Positions vacant.....	29

Breakdown:

Executive Officers.....	25
Finance Officers.....	88
Program Administration Administration Services and Information Services Officers.....	25
Joint Services Officers (serving Dept. of Finance and Treasury Board Secretariat).....	23
Computer Programmer.....	1
Clerical Staff.....	89
Stenographic Staff.....	88

Total..... 339

Full-time Research Consultant..... 2

OFFICER STRENGTHS AND PERCENTAGE TURN-OVER—PERIOD 1962-69

Year	Strength	% Turn-Over	Remarks
1962/63.....	138	2.9%	Build up in strength largely due to increases to the Treasury Board Staff
1963/64.....	149	13.4%	
1964/65.....	152	11.8%	
1965/66.....	177	13.6%	
1966/67.....	203	10.8%	
1967/68.....	137	19.0%	Treasury Board staff separated from Finance in Sept. '66, not included in turn-over percentage
1968/69.....	152	11.8%	
Jan 31 '69.....	161	—	

CLASSIFICATION OF PROFESSIONAL STAFF

(a) No degree

Country of:	Birth	Secondary Education
Canada.....	22	25
U.S.A.....	1	1
England.....	2	
Scotland.....	1	1
Holland.....	1	
	27	

Mean number of years since graduation: 28.3

Mean number of years with the Department of Finance: 9.1

Average age: 46

Per cent effective in both official languages: 18.5%

(b) At the Bachelor's level

Country of:	Birth	Secondary Education	Bachelor's Degree
Canada.....	58	66	67
England.....	8	4	5
Iran.....	1	1	1
Germany.....	2	2	
U.S.A.....	1		1
India.....	1	1	
Turkey.....	1		
Scotland.....	1		
Rumania.....	1		
	74		

Mean number of years since university graduation: 12.6

Mean number of years with the Department of Finance: 4.7

Average age: 37

Per cent effective in both official languages: 33.7%

(c) At the Master's level

Country of:	Birth	Secondary Education	Bachelor's Degree	Master's Degree
Canada.....	34	36	37	30
Holland.....	1	1		
Sweden.....				1
England.....	3	3	3	6
Scotland.....	1			
U.S.A.....	1			2
Denmark.....				1
	40			

Mean number of years since Master's degree: 11.1

Mean number of years with the Department of Finance: 8.2

Average age: 35

Per cent effective in both official languages: 32.5%

(d) At the Ph. D. level

Country of:	Birth	Secondary Education	Bachelor's Degree	Master's Degree	Doctorate
Canada.....	3	5	4	3	1
England.....			1	2	2
U.S.A.....			1		2
India.....	1				
Germany.....	1	1			
Ireland.....	1			1	1

Mean number of years since Ph. D.: 24.5

Mean number of years with the Department of Finance: 6.1

Average age: 44

Per cent effective in both official languages: 50%

PREVIOUS EXPERIENCE OF PRESENT STAFF
January 31st 1969

Industry.....	23.4%
Staff of University.....	8.5%
Provincial Government.....	9.4%
Other Federal Agencies (including Armed Forces).....	31.5%
Total.....	72.8%

NUMBER OF STAFF ON EDUCATION
LEAVE

With Bachelor's Degree	With Master's Degree
2	1

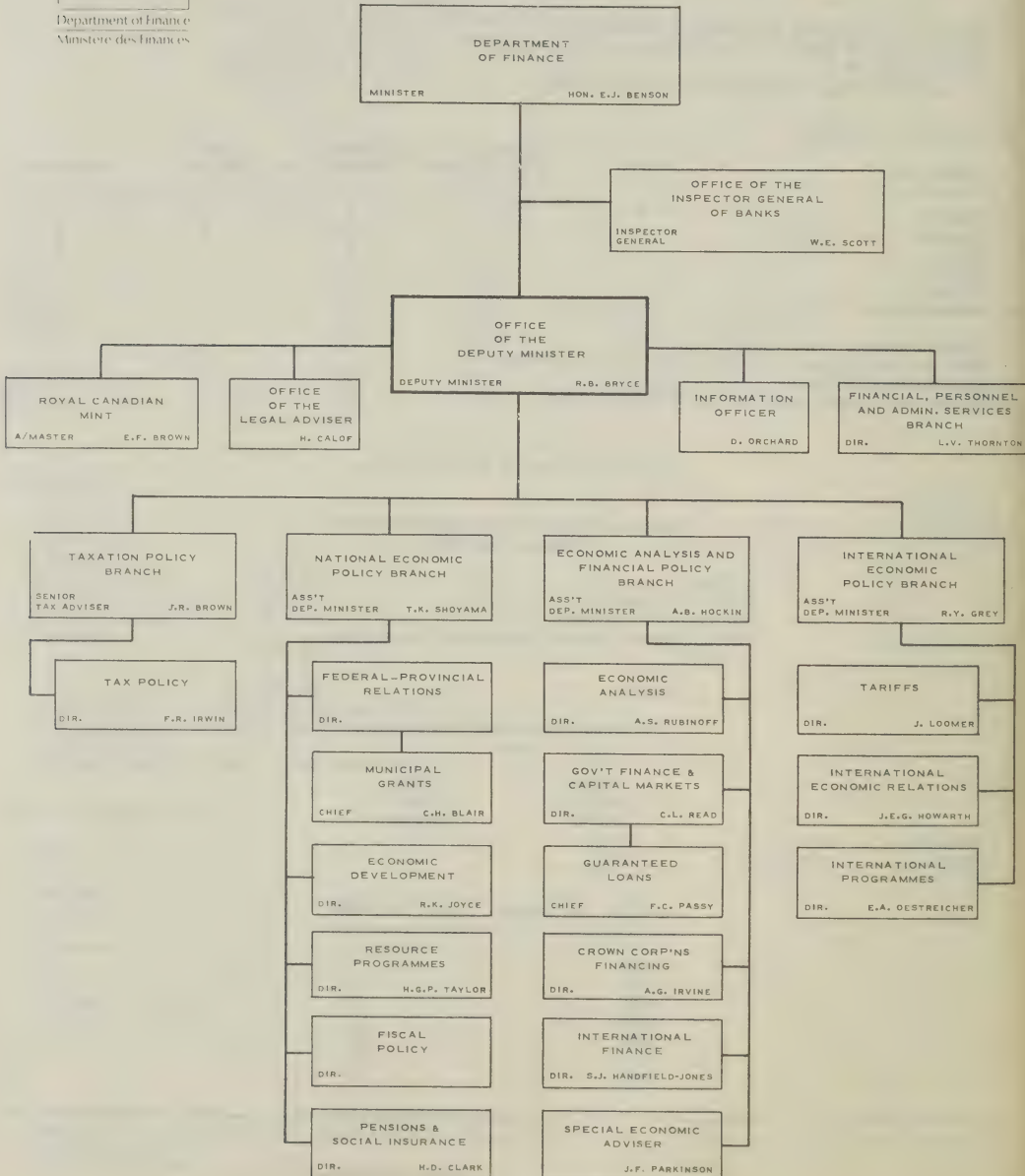
SUMMER STUDENTS—YEARS 1962-1968

1962.....	3
1963.....	3
1964.....	2
1965.....	10
1966.....	22
1967.....	17
1968.....	16



Department of Finance
Ministère des Finances

DEPARTMENT OF FINANCE - GENERAL ORGANIZATION



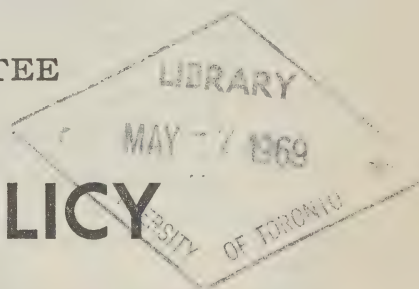


First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 35

WEDNESDAY, MARCH 5th, 1969

WITNESS:

Maurice Goldsmith, Director, Science of Science Foundation,
London, England.

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate

MINUTES OF PROCEEDINGS

WEDNESDAY, March 5, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Blois, Bourget, Carter, Giguère, Grosart, Hays, Kinnear, Lang, Leonard, McGrand, Robichaud, and Yuzyk—14.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witness was heard:

Maurice Goldsmith, Director,
Science of Science Foundation,
London, England.

(A curriculum vitae of the witness follows these Minutes).

At 5:40 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Goldsmith, Maurice began his academic life as an economist and sociologist. He became interested in the significance of the natural sciences and turned to a study of physics. He began to express his ideas as a science writer in the mid-1930's, and was a founder-member (First Secretary-Treasurer) of the Association of British Science Writers. Invited to join UNESCO in 1949, where he was concerned with problems of the communication of science. In 1953 he set up his own organization, Science Information Service, in London. In that year he began also publication of science magazines for schools. He has much experience of the mass media, and is now concerned with a redefinition of the concept of the popularization of science. His activities and interests in promoting understanding and appreciation of science are wide. He does not rate the scientist more highly than the artist—both are significant. His books include: *The Scientist and You* (editor), 1959; *The Young Scientist's Companion*, 1961; *the Young Physicist's Companion*, 1962; *Mechanisation in the Classroom* (editor), 1963; *Careers in Technology*, 1963; *Science, History, and Technology* (joint author), 1965.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, March 5, 1969

The Special Committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (*Chairman*)
the Chair.

The Chairman: Honourable senators will recall that during the first days of our inquiry we heard a certain number of wise men from Canada and abroad who had a great knowledge of science policy, of the science of science or, as we heard in Toronto last weekend, science squared. This exercise has been more than useful to us and I think it should be continued as occasions arise.

We have today one of those very fortunate occasions. Mr. Maurice Goldsmith, who is Director of the Science of Science Foundation in London, England, is at present making a Canadian tour and studying more closely the Canadian science and research effort. He has been good enough to interrupt his visits to Canadian universities and accept my invitation to appear this afternoon before our committee.

A detailed biography of our guest has already been circulated, and will, of course, be printed in our proceedings. Therefore, without further introduction I will now invite Mr. Goldsmith to give us the benefit of his views on science policy, views which are based on a wide and varied experience.

Mr. Maurice Goldsmith, Director, Science of Science Foundation, London, England: Thank you very much indeed, Mr. Chairman and senators, for the privilege of coming before you in this way to give you some comments of my own experience in the field of the science of science and of science policy. I must apologize that I have no written statement, but as you, sir, have pointed out, this has been thrust upon me suddenlike, and I am extremely happy to have accepted your invitation.

In a sense, I am highly motivated so far as Canada is concerned, because I have always

been interested in the problems of this country and have made a number of visits over here during the past 12 to 15 years. Also, last year we were extremely fortunate in that Dr. Solandt, Chairman of your Science Council, accepted an invitation from the Science of Science Foundation to give the annual lecture of the Foundation in London, England. He was one in a rather distinguished series of speakers. The year previously the annual lecture has been given by Sir Solly Zuckerman, the Chief Scientific Adviser to the British Government.

I think it is clear from the evidence you have already heard—and I have looked through the evidence that has been published—that one basic idea of modern politics is shared by all governments, whether they are capitalist or socialist and whether their economies are planned or semi-planned: this is that science and technology are the necessary means to produce more wealth and to promote the people's welfare. Among the statements made about this there is one that is typically relevant. It was made a few years ago, in 1964, by Alexei Kosygin, Chairman of the Council of Ministers of the U.S.S.R., when he said:

Under the present conditions the development of science is one of the factors decisive for our economic growth.

This statement, of course can be paralleled by similar statements made by leading government ministers in almost all countries.

Science policies are aimed at directing the use of resources for research and development. It is interesting that there is this similarity of views between different forms of government; this may be as important historically as are the differences of outlook on other matters.

Science policy I regard as an expression of a radically new approach to economic and social policy, but even now the questions

about scientific and economic policy and many of the solutions proposed are arrived at intuitively and empirically. There is no background theory available to help in decision-making. Even as economic policy now has available a body of economic theory, developed particularly since the day of Keynes, I believe that science policy will also come to be so provided, so that the hot wind of irrationality will be taken out of decision-making in national science policy. This can be done only by basic research designed to assess the factors responsible for the growth of science, by developing a body of science critics competent to take a critical look at government decisions on and for science. This, Mr. Chairman, is what the science of science, or science squared, is about. Its concern is to lay the intellectual foundations, among other things, of science policy.

The growth of science up to now has been the result of a rather promiscuous collusion between the practitioner of science, the educationist and the politician, but the clamour for exports and experts, for improved productivity and for trained manpower, and the need therefore for centralized planning through a national science policy based upon rational criteria for decision-making, is resulting in redefinition. I believe that never again will science and technology be left free to grow entirely by chance, as they have done up to the present moment.

The science of science, very simply, is concerned with insuring that science no longer develops haphazard and uncontrolled.

We seek a rational and explanatory account of the structure and behaviour of science. That is we use the methods of science to study the processes of science itself; the fact is that even the practitioners of science, who regard scientific method as the most distinctive of human activities, have only just begun to see that science now needs to be studied as are other human activities. We need to look internally at science as a discipline with its own history and logic in order to determine whether there are laws of growth within science. If we can determine that there are, then we shall be able to predict and use science as a tool more wisely. Second, we need to look at science externally in its effect on society.

Both these aspects are covered in this new field of research to which we have given the name science of science.

In order to study science, it is necessary to do research in a whole variety of topics, such as the sociology of science and its history, the psychology of scientists and of creativity in scientific work, the flow of scientific information, the popular communication of science, operational research in science and the principles and philosophy of planning in science. We have also to study the role of science in different types of society, decision making in national science policy, the economics of science, scientific advance, and the planning of research and development.

I have been told often that the separate things I have mentioned are being done. Of course, it is true, but we believe that when these are done in isolation they may make some contribution to knowledge, but only a co-ordinated consideration of balanced interactions will prove meaningful if it is to this co-ordinated consideration that we give this name, science of science.

The phrase "science of science" was first used just over 30 years ago, and it has come into a popular use only in the last 10 years. The Science of Science Foundation is now recognized as having begun to institutionalize the science of science. May I say very speedily, Mr. Chairman, that the Science of Science Foundation in the United Kingdom is registered as a company limited by guarantee and entered into the register of charities as an educational trust.

We believe that science is one of the subcultures and that the other subcultures of the arts and humanities are equally important if we are to begin to solve the serious problems that present themselves to us in living in an age of technological revolution. Because of this we have on the Advisory Council and on the various committees a range of individuals who represent all the cultural patterns in the broadest sense. The president of our advisory council is the Nobel laureate, Sir Peter Medawar, FRS, a distinguished biologist. We have Professor H. Bondi, FRS, an internationally known mathematician; Professor Asa Briggs, the Vice-Chancellor of Sussex University, and a distinguished social historian; and Charles Carter the Vice-President of Lancaster University, an economist who first began studies in Britain in this whole field of research and development and national economic growth. These are: the artist, Sir Robin Darwin, the Principal of the Royal College of Art in Lon-

don; Dr. Alexander King, you have already heard; and Gerard Piel, the publisher of the *Scientific American*. We also have Professor D. J. de Solla Price, the historian of science at Yale; a distinguished British Q. C., George Rink; the man responsible for the phrase "the two cultures", Lord Snow or C. P. Snow; Lord Jackson of Burnley, FRS, a well-known engineer, and chairman for many years, of the Government's Manpower Committee.

The SSF Committee of Management has an equally mixed group. The chairman is Dr. J. B. Adams, at present Member Research of the United Kingdom Atomic Energy Authority, who has just accepted an invitation to become the Director of the 300 GEV High Energy Particle Accelerator Project which CERN is to start somewhere in Europe. So, Mr. Chairman, the science of science has practical expression through the Science of Science Foundation.

Now, I would like to look at some of the organizational problems which you here are involved in, but before I do so I would like to mention that the Science of Science Foundation is not only a body concerned with promoting theoretical studies, but also is concerned with practice. We were responsible jointly with the Ciba Foundation for an international symposium on "Decision Making in National Science Policy" which was published at the beginning of last year. It is a book, which to my great pleasure, I find many of the people in this country who are concerned with problems of decision making now using as a basic text.

We are organizing also in April of this year at Churchill College in Cambridge, an international symposium on "Technological Innovation and the Growth of the Economy." I am happy that Andrew Wilson, from the Science Council, will be officially representing Canada on this occasion. The SSF are not just a sort of long-haired group trying to do romantic things, but we are concerned with very practical problems. We recognize that without basic theory, practice would have to be based on a purely pragmatic, and opportunistic, approach and in that way we really would not get very far at all.

Now, Mr. Chairman, may I make some very personal comments on what I have observed here in Canada, especially in terms of the very vivid discussion that is now going on in relation to science policy. I have found this extremely exciting, because I have not known

in the many countries that I have visited the same degree of excitement about science policy. Really I suppose this represents something extremely important to people in Canada.

In 1966, an OECD committee on Government and the Allocation of Resources in Science dealt with the performance of certain essential functions by central agencies of government. The essential functions were: (1) interdepartmental co-ordination; (2) long-term strategic planning; (3) secretarial, statistical and other services; (4) co-ordination with educational and economic policies.

I mention these specifically because I feel that the discussion about this may have some relevance to the debate which is going on here at the moment, as to what should be the organizational forms developed to implement proposals for a national science policy.

Dealing with these in order—(1) interdepartmental co-ordination—clearly, this arises from the many-sidedness of support for research, in which there is a danger of duplication, omission and unco-ordinated growth.

In France, there is an interministerial Committee for Scientific and Technological Research, which is assisted by the Délégation Générale for Scientific and Technological Research. In the U.S.A., there is the Federal Council for Science and Technology assisted by the Bureau of the Budget and the Office of Science and Technology. These act, in a sense, as the central organization to secure rationalization and co-ordination.

I must confess that I am not very clear how this is done in my own country, but we do have an Advisory Council on Science and Technology, which is a central grouping linked to the Ministry of Technology. We do have research councils and there are special links developed in terms of officials and invited members who may sit on the main committees.

This co-ordination might lead to a science budget, as exists in some way in France and Belgium. The French science budget, for example, has an *ex-ante* approach, that is, it shows all the research and development items of all the departments separately in their estimates, except that there are no disclosures about nuclear work, space research, and defence. These items are collected by the Délégation Générale and are passed on to a consultative committee of scientists. This

committee looks at these and makes recommendations to an interministerial committee, which then recommends to the Government the general size of the science budget and the principles of its distribution.

We do not have this in the United Kingdom, and I do not think it exists in the United States. In my own country, there is a general feeling that it is better to relate scientific programs to social activities or to specific activities, such as defence or medicine, rather than to other scientific activities.

This OECD report did make an interesting suggestion about an ex-post approach, that is, an agreed presentation of departmental expenditures in science, once the allocations had been made. This would be extremely useful, as it would make clear the demands of politics upon science. It would present also what is called the "opportunity cost" of certain large scale commitments of scientific resources, say, the amount devoted to space research or high energy physics and so on. This would then provide the necessary information for the public and might lead to a general debate by the public about these forms of expenditure.

The report also suggests that it would be useful to present this scientific spending as part of the total national spending. This, of course, would mean that it would be useful to develop a national inventory of scientific resources which would include manpower, plant and equipment, and so on.

Also, the report suggests that in terms of interdepartmental co-ordination, there ought to be machinery to identify possible areas for such co-operation in "complex projects"—this is the phrase that they have picked up from the Russians—that is, areas which need to be co-ordinated and which would result in existing departments or institutions being brought together in their research activities.

I think that there is a case, and a strong one, for interdepartmental co-ordination. The organizational form that is required to do this is another matter, to which I shall return in a moment.

Then there is long-term strategic planning. This is usually done by high level scientific advisory bodies. In Britain, for example, there is the Council for Scientific Policy, which reports to the Secretary of State for Educational Science and there is the Central Advisory Council on Scientific Technology,

which reports to the Minister of Technology. As I have said, there are formal contacts between these, because of overlapping in their membership, but clearly long-term strategic planning is important if we are to have a perspective against which the short-term projects can be measured. This is something that might be done by the Science Council.

Then, the third point, secretarial, statistical and other services: The report suggested that most of the bodies then existent had part-time staff and that there was a need for a full-time secretariat. It was necessary to identify issues, pose questions, and ensure a flow of new ideas into the political system. Quite clearly, so far as I am concerned, this seems to be the role that the Science Council is fulfilling, or will be required to fulfill, in the future.

Finally, there is the question of the co-ordination with economic and educational policies. This is concerned with the need to organize discussion between scientific and non-scientific agencies of government on, for example, manpower policy, social and economic needs, R & D, national development, and so on.

What are the organizational forms which might take care of these essential functions? I have heard suggestions in this country—and these are very personal views on my part and necessarily incomplete because I do not know the Canadian scene sufficiently intimately—for a department of science, for a ministry for science policy, and for a ministry for scientific affairs. The arguments I have heard would indicate that by and large a department of science would tend to be regarded as "interfering" in the affairs of other departments. If it is felt by those who know the Canadian scene that this is so, then of course there is no point in pursuing this one any further, except to say that in countries which I know departments of science do not seem to have been all that successful. We had in Britain at one time the first minister for or of science, then Lord Hailsham now Quintin Hogg. (He wanted to enter the House of Commons in furtherance of his political career so he gave up his peerage.) As a result of that particular experience, successive governments have never re-appointed or named a minister of or for science. Of course, this had nothing to do with the quality of Hail-

sham, but rather with the complexity of the situation.

A minister for science policy is an extremely interesting suggestion. If such a minister were to be appointed, the Science Council would be an important factor in providing the basic studies required to allow him to operate.

The other suggestion is to have a minister for scientific affairs. Again, I think this is a very interesting suggestion because it indicates that a minister for scientific affairs might include the functions of a minister for science policy, and would also include the need to concern himself in what is happening in science in various departments.

However, whatever the final decision arrived at, one can only measure the significance of the appointments in terms of the powers the minister has to get things done. This, Mr. Chairman, in practice means, so far as I can tell from other countries, that there must be some kind of special understanding on the part of the chief minister, or the prime minister. In fact, we know from experience in other countries that if you want to get things done and if you have a strong prime minister, then things do happen.

The question has arisen—and I want to spend a minute commenting on this—of providing the scientific community with a voice. I have heard suggestions that the Science Council might become this voice. If the scientific community feels it needs a general voice outside of its specialized institutions, then this requires to be considered. But I do think it might be unwise if a body such as the Science Council came to be regarded as a kind of propagandist voice, because science policy concerns the well being of the whole community and the statements that the Council prepares must be objective. If they are not objective statements on which everyone can rely, but are regarded as presenting or representing particular interests, then I think the value of such a body at this level in the government machine would fall to the ground.

I want, if I may, to say also that Sir Solly Zuckerman, whom I have mentioned as the Chief Adviser on Science to the British Government, has had probably the longest experience in the world in this field. Since the beginning of the last war, he has been involved in advising governments on policy. He has said:

Science is inevitably in the public arena and decisions about the deployment of our scientific resources must in the end inevitably be political. Advisory bodies can only advise. In our system of government the power of decision rests with the minister concerned or with the government as a whole or with boards of companies. Although we are learning fast, the scientist as we stand today not only does not have the responsibility for public discussion, but also still lacks the apparatus with which to predict the repercussions of technological development, and it is the repercussions which more than anything else transform the sphere of politics, not straightforward decisions like that of increasing the size of the scientifically trained population.

Science policy would have a much greater meaning than it has if only there were fewer unknowns in the scientific and technological process and since the scientist is in the public arena only as the expert worker and adviser it is his employer, whether it be the government or the board of an industrial company which commands his service and the responsibility for action, the decision whether to accept or reject his advice is theirs and theirs only. If the scientists who now advise want more than this then they will have to become politicians or if not that then leaders of industry.

I have quoted this at length, Mr. Chairman, because I think it is an important and wise statement. Sir Solly has referred to the fact that we are required to have fewer unknowns in the scientific and technological process. It is in this regard that I think science of science has a particular contribution to make, because if we can increase our understanding of the internal processes of science and of the effects of science on the community in which we live, we can then reduce the number of unknowns, and in reducing them it becomes much easier to help make decisions.

We have to recognize that from the scientific analysis there may come some advice to governments, but it would be dangerous to confuse the objective study with the advice. They are two different things. The objective study has to be re-interpreted in terms of what the government of the day requires.

One other comment, Mr. Chairman: in the discussions in this country I have had a very strong feeling that the public must in some way be brought into the decision-making process. They do this indirectly whenever they have the privilege of voting, but I think something much more intense and immediate and familiar is required continuously, because there must be a recognition within the country that science and technology is of importance and that it is no use that scientists and some politicians should say so. There must be developed a scientific and technological temper within the country. This, of course, is part of, or should be part of, the whole educational process.

Without the development of a technological temper it will be very difficult to get the sympathy for expenditures on science that is required at the present day. Therefore, attention should be paid to forms which are required to insure that the scientific and technological pulse of the people is felt continuously, and there may be merit in the suggestion I have heard that the Association for the Advancement of Science now in Quebec might be extended to include the whole country, so that it performs a kind of AAAS function.

I do feel, also, that you ought seriously to consider the possibility of an on-going role for this very committee to which I am honoured to have been invited to present some views.

In Britain, we have the Parliamentary and Scientific Committee, which is an informal body meeting regularly at the House of Commons, on which are represented members of both houses, plus scientists and industry. This is an extremely useful forum for the exchange of views. There are regular monthly meetings, and the members of the house really get an idea of what industry and the general scientific community is thinking and feeling. I have had the impression here that this committee of yours, Mr. Chairman, has come in a sense to be regarded by the scientific community as a kind of ombudsman. I know this is not your function, but it does express something to which attention requires to be paid.

I have just one story, Mr. Chairman. The scientists, it has been suggested, must always be on tap, but not on top. I am reminded of the story of Blondin, a famous tightrope

walker who, towards the end of the last century, proceeded to do his famous walk across Niagara Falls. I think this was to be about 1,100 feet on a tightrope. This was a great occasion. Blondin stepped onto the tightrope carrying his assistant on his shoulders. After they had gone a little distance his assistant said, "Well, sir, I think we have demonstrated that we can do this. Do you not think we ought to turn back?" And Blondin looked up at him and said, "Not at all. You may be on top but I am the one who is determining where we are going."

Finally, Mr. Chairman, as I believe in the equal relevance of all the subcultures and believe that the poets and writers can always provide us with some special insights, a quotation from the English poet, W. H. Auden, from his poem New Year:

The choice of the patterns is made clear
which the machine imposes.

What is possible and what is not, to what
conditions must we bow
in building the Just Community now.

Thank you.

The Chairman: Thank you very much.

Hon. Senators: Hear, hear.

The Chairman: I can see in this last quotation where comes the Canadian concept of a just society. Thank you very much indeed, Mr. Goldsmith, for this much illuminating talk. I am sure that you have raised all kinds of questions in the minds of the members of this committee, so if you do not mind we will proceed immediately to the discussion period. Who is going to be first?

Senator Carter: I wonder if Dr. Goldsmith would mind telling us a wee bit more about the Science of Science Foundation. I would like to know how long it has been in existence, how big a staff you have and what are your relationships with educational institutions on the one hand and Government institutions on the other hand.

The Chairman: And how is it being financed.

Senator Carter: Yes, the budget.

Mr. Goldsmith: Mr. Chairman, the Science of Science Foundation first began to operate in 1964. We began because we felt that this was something useful to do in social terms, and then in the middle of 1966 we recognized

that interest was growing at such a great rate that we had to provide some established legal form for it. So we set up this educational trust.

From the beginning, we were concerned with attempting to clarify for ourselves what exactly we mean by the science of science. It is all very well having the general phrase, but what on earth is it, what is a science of science approach to education, what is a science of science approach to technological innovation, and so on. We began a series of key seminars on the financial aspect. The Science of Science Foundation is not endowed by any industrial or government group.

We have been provided with certain facilities by the CIBA Foundation in London, and by various other bodies. What is happening now is that our activities have grown so that we are, on March 24, leaving the CIBA Foundation and moving into other premises. Our full-time staff is not at all large. It consists of about three people. Our part-time staff of volunteers—and this is something that we have developed quite deliberately, because we believe in flexibility—is extensive. We have a number of committees—an editorial committee, an educational committee, an industrial committee, a library committee, a medical committee, a science critics panel. We can call upon the services of about 70 people, who are prepared to give up time to work on our committees.

We have set up at the University of Sussex a Science of Science Foundation Library, which we hope will contain the most complete collection of science of science material in the western world, and which is gathering new material at a remarkable rate. This material is available to any genuine student, and facilities for study are provided in the resources that we have at the University of Sussex.

Our seminars have been addressed by such distinguished people as Sir Peter Medawar, FRS, on "Creativity"; Dr. A. Rahman, Director of the Research Planning Unit at the CSIR in New Delhi on "the Planning and Organization of Science Research in Developing Countries"; Professor Asa Briggs on "The New Model for Adult Education"; Dr. Arnold Kramill of the Rand Corporation, now of the Institute for the Future, on the "Technological Gap"; Sir Charles Goodeve, FRS., on "Research and Development"; Dr. A. C. Cottrell, FRS, now Sir Solly Zuckerman's deputy, on

"Science and Economic Development," and many other well-known people.

Each of the various committees organizes seminars. For example, during recent months we have had a series of seminars, organized by the Industrial Committee, on the right environment for creativity in applied research. These have been post-graduate seminars held at Imperial College in London. Among the topics considered were studies in the psychology of scientific creativity in industrial laboratories; the psychology of the scientist in a business environment; the professionalization of the science student; the introduction of a company philosophy using socio-technical assistance concepts and its impact on scientists.

The Library Committee have had a series on the re-organization and documentation of communication, with special reference to science and technology. The Medical Committee have been concerned with the tools of health service planning and the perturbations which will be caused by new developments. The Education Committee dealt with the interphase between education and industry, and so on.

We have had an international symposium on decision making in national science policy, and we have the one on technological innovation next month.

We have an annual Science of Science Foundation lecture, which is given each year at the Royal Institution. The first was in 1965 on the scientific foundations of science policy by Professor A. J. de Lolla Price; the second by Dr. S. Dedijer, the director of the science policy program at the University of Lund in Sweden; the third was by Sir Solly Zuckerman; and the fourth by Dr. O. Solandt. The fifth, to be given by Dr. Robert Charpie, President of Bell and Howell, on "Technological Innovation and the Growth of the International Economy."

There are very many other activities in which we are involved, and we have also close contact with the science of science groups in countries such as Czechoslovakia, Australia, Hungary and so on.

We have a number of publications, many of which have been translated and published. The *Science of Science*, for example, now published as a Penguin book, has now appeared in Russian, Japanese, Italian, and

Spanish. I hope that gives you some information.

Senator Carter: Yes, thank you. If I understood you correctly—I may be wrong—my impression was that you described the objectives of your foundation, that you reduce the number of unknowns in scientific development processes and you have just cited a number of seminars and you also referred to some theoretical studies.

Mr. Goldsmith: Yes.

Senator Carter: Are there special studies going on, apart from the seminars?

Mr. Goldsmith: Yes. What we are doing is instigating studies. It is rather difficult, because the field is so new that the scientists of science do not yet exist. There are studies that we would like to see done, and that I think could very usefully be undertaken in Canada. These would really make a contribution to basic knowledge, as a result of which there could be practical application. For example, what is the efficiency of basic research? That is a very important question. There is work being done in different places, but much more is required because it is an important problem. Should the head of the department really be the organizer of basic research? This is a question that requires an answer of some kind. We work by tradition in the scientific field.

Senator Carter: I gather what you are trying to do is to discover the laws that govern the development of science itself.

Mr. Goldsmith: That is right.

Senator Carter: Your seminars, as I listened to them, covered a wide field. They covered medicine, decision-making, economic development in different countries. Have you got far enough to have any laws emerging?

Mr. Goldsmith: Not from seminars, because the seminars themselves are designed deliberately to get people from different disciplines to come together. All our seminars are multi-disciplinary. No seminar consists only of natural scientists or just social scientists. All seminars bring in all the disciplines, and if I can get the artist and humanist to come along as well, all the better. They must be multi-disciplinary. The purpose is to get people to think in a science of science way,

but the basic research must be done within the university. This is beginning; a number of universities—Edinburgh, Sussex, Manchester, Bath, Bradford and Loughborough—are already beginning to look at these basic problems. The research must be done within these universities. The field is so very wide open at the moment that there are any number of Ph.D. theses that can be written. It is only if we can obtain this basic knowledge that we can then make recommendations about the application.

For example, one of the theories with which you are familiar is that of the exponential rate of growth of science; that is, that since the days of Galileo and Newton science has been doubling in the western world roughly every ten to twelve years. Well, this is a theory. It requires to be looked at rather critically and carefully. Also within developing countries the doubling rate is said to be about five to seven years. If this is so, quite clearly in terms of our expenditures of resources we must take account of this, because if there is this kind of growth we must clearly examine the implications to see what are the practical requirements of this kind of theory. In this field of the laws of growth of science, or of the way in which scientists behave, we just know nothing at all; we know more about the moon than we do about science as a social phenomenon.

Senator Carter: I should like to follow this question a step further. You said all your seminars were multi-disciplinary. Is that because you are working on the theory that there are general laws basic to all fields of science rather than specific laws for each different field?

Mr. Goldsmith: We are working on the theory that science is a unity. Science in Britain is the natural science, as you know, and this is what we call the Anglo-Saxon heresy. On the continent it is what the Germans call *wissenschaft*—general culture, general knowledge. I think we have arrived at the stage when we must recognize that what is equally important in terms of the problems that face us is the possibility of finding various non-technological solutions to these problems. In other words, if we have pollution of the atmosphere we can call in a chemist or an engineer to find a technological solution. But could not the behavioural scientist and the lawyer also provide a solution of some kind?

It is only in this multi-disciplinary approach that we begin to find both technological and non-technological solutions to these common problems.

Senator Carter: I should like to go back to your comments on the Canadian scene. You said you had heard three ideas, which were to have a minister of science, a ministry of science policy or a ministry of scientific affairs. I was trying to distinguish between these three entities as you were talking about them. I gather the only way you distinguish between them would be the powers vested in them?

Mr. Goldsmith: Not exactly. I think a department of education and science would really be a combination, of the Ministry of Technology in Britain and the Department of Education and Science. It would be a real department, whereas the other two suggestions, as I understand them, would not necessarily have a department linked to them. In other words, a minister for scientific policy or a minister for scientific affairs would really have an important co-ordinating et cetera function and would not necessarily have a department of any kind which he would be running.

Senator Carter: Probably you, Mr. Chairman, can enlighten us on this. My impression is that we already have something like that now, because the honourable Mr. Drury, who I think is the President of the Privy Council does not have a department but he certainly has a responsibility...

The Chairman: He is not the President of the Privy Council.

Senator Carter: What is he?

The Chairman: He is President of the Treasury Board.

Senator Carter: He does not have a full-fledged department.

The Chairman: In so far as he is President of the Treasury Board he has a department.

Senator Carter: The only drawback is that he himself as minister of science would be passing judgment as President of the Treasury Board on his own estimates and that sort of thing. He has some responsibility at the present time, I gather, to evaluate what is going on in agriculture, fisheries and other

departments, so that would be the beginnings of a ministry of science policy.

The Chairman: To be more precise—I am sure Mr. Goldsmith already knows, because this was discussed in Toronto during last weekend—Mr. Drury at present is not only President of the Treasury Board but is also President of the Inter-departmental Committee of the Cabinet on Science and Industrial Research and the National Research Council also reports to him.

Senator Carter: Yes, but what I was leading up to is if you go beyond that.

The Chairman: But, the Science Secretariat and the Science Council both report to the Prime Minister.

Senator Carter: Yes, but if we had a full-fledged Minister of Science Policy I do not see how he could function unless he had powers to veto or some superpowers to veto or make decisions with regard to the scientific projects in other departments.

Mr. Goldsmith: I cannot say anything on this, Mr. Chairman, because as you recognize these are rather delicate political matters and which obviously have important implications. All that I can say is that theoretically these three possibilities that I have mentioned have been brought up in this country, I tabled these. What is required is a co-ordinator. Whether this co-ordinator would also be empowered by the Prime Minister to have a veto function I am not competent to say at all. This would depend entirely on whatever the Prime Minister thought was necessary.

Senator Carter: If you got to the point where someone had to decide priorities he would either have to persuade the other ministers to his way of thinking or else he would have...

The Chairman: As capacity as chairman of the committee.

Senator Carter: I am not talking about if we had a Minister of Science Policy.

The Chairman: Presumably, if you had such an animal he would also be president or chairman of that Cabinet committee on scientific and industrial research, and that is where it could...

Mr. Goldsmith: Such an individual would have available special studies, say from the

Science Council, which would offer him a series of objective alternatives ranged in order of importance. This is proposal No. 1, which will have the following effect. This is proposal No. 2, which will have the following effect given et cetera, et cetera. That kind of advice does not exist at the moment.

Senator Carter: Thank you.

The Chairman: We will come back to this later.

Senator Lang: Mr. Chairman, in listening to Dr. Goldsmith, I always have nagging in the back of my mind the suspicion that the word science of science is a contradiction of terms. I noticed that when you enumerated the governors of your institution, from my lack of knowledge of who they might be, I assumed they were probably scientists like yourself. This is the form of my question that I may be asking you to decide. This is not a question that I expect an objective answer on. Is not perhaps philosophically the scientist the least competent man to judge science policy? Are we not, if we set up institutions to ascertain a science of science, we are begging our question. The scientist may very well be the least competent person to judge science. Maybe the politician is the most competent person to judge science or maybe even the lawyer. Where can the peer judge the peer with a degree of objectivity necessary to philosophically achieve your ultimate aim? If our guest would comment on this I would appreciate it.

The Chairman: I am sure he will.

Mr. Goldsmith: Mr. Chairman, this is a very important question, but factually may I say first that the advisory council in the committee of management does not consist only of scientists. It consists also of artists, and businessmen and economists and behavioural scientists.

Senator Lang: And one Q.C.

Mr. Goldsmith: And one Q.C.

The Chairman: Do you not think it is enough?

Senator Lang: Far too few.

Mr. Goldsmith: In addition, Professor Raymond Aaron the distinguished French sociologist whom we discussed this with, put it quite well. "The function of the science of

science is to forecast technological evolution, and the function of science policy is to illuminate discussions and to make them more rational or clearer for the people who are taking the decisions", so that as I have said, Mr. Chairman, there must be complete objectivity in the basic documents that are provided to the politician. I want to insist upon this, because it is the politician who has 'to take the can back', not the scientist. Therefore, to the politician must be left, in a democratic society, or any other society if it comes to that, the ultimate decision as to which particular recommendations shall be implemented or not. I hope that I have answered the senator's question.

Senator Lang: I think maybe you have ducked my question.

The Chairman: If you are not satisfied come back with a supplementary.

Senator Bourget: If you pass to the politicians do you think we should not have then a minister responsible?

Mr. Goldsmith: I did not get the beginning. I am sorry.

Senator Bourget: If you are saying that the final decision should rest on the politicians am I right in saying this?

Mr. Goldsmith: You are right.

Senator Bourget: Then, does it mean also that for that part there should be established an administrator of whatever you call it, technology or science, one man in the Cabinet that would be responsible for it also?

Mr. Goldsmith: I think this is one of the possibilities that somewhere or another there ought to be somebody responsible for weighing up the objective advice that is offered in terms of science policy.

Senator Lang: By scientists.

Mr. Goldsmith: I do not know what you mean by the term scientist.

Senator Lang: I am trying to get back. I think probably my colleague is taking the other end of the spectrum. My question is this, is a scientist competent to advise the politician as to science policy?

Mr. Goldsmith: I think the scientist is competent to say that if we continue to allow waste products from industrial chemical es-

tablishments to flow into our rivers and lakes that we pollute these, and then to support the statement by objective scientific fact, I do not see how the politician can do anything but call upon the scientist to provide him with the evidence for this. The scientist is the person who is required in a scientific and technological society to consider the implications of science and technology and then to make recommendations to the politician. In the same way as if you, senator, were concerned with say transferring some property to somebody, you would go to a lawyer. You would not go to another politician. That would be stupid.

Senator Lang: I think you have ducked my question again with respect.

Mr. Goldsmith: I think it ought to be rephrased then; I do not get it.

Senator Lang: Let me try to rephrase the question. You have invited me to do so. You may admit my premise, that judgment by one's peers may be a very fallacious judgment.

Mr. Goldsmith: It is a basic democratic principle.

Senator Lang: I am not concerned with democracy, I am referring to truth. It may not be consistent. I am suggesting that perhaps a judgment of scientists by their peers is not in the best interests of science. It may or may not be.

The Chairman: I think our guest this afternoon has already answered that question—and he agrees with you.

Senator Lang: Yes, he agrees. I am saying is or is there not something in the governmental structures that will provide the synthesis of the political action on the one hand and the scientific advice on the other, I do not think, to use your words, there is an interphase or there can be an effective interphase, between the purely scientific advice and the political. I think there has to be a synthesis somewhere that will produce objective advice for the politician. How this is created I am not sure, but I think this is a form of machinery which we should be looking for.

Mr. Goldsmith: Yes.

Senator Lang: There may very well be—in your example, pollution—in order to restrict the use of automobiles, it may not be just a

question of eliminating carbon monoxide from the air or the effluent into a river: it may be also by controlling human behaviour through a feasible means, by the use of magisterial force. I do not know, but I am wondering if there is not here somewhere, in between, to avoid what I consider inefficient interphase between the purely scientific community and the purely political judgment.

Mr. Goldsmith: On this last point, I think there ought to be, obviously, some kind of individual who can make an assessment on the advice given by the scientist.

I think, also, that if what you are suggesting, senator, is that the scientists should have, say, politicians present in their discussions, this is up to whether this is likely to be useful or not, I do not know.

Senator Lang: It could happen.

Mr. Goldsmith: May I just tell you a story. Civil scientists became known in Britain in the year 1863, when the first of the Alkali Acts was passed. This was due to the fact that in, I think, the northern midlands of England, some of the landed gentry discovered that their land was being destroyed, it was no longer as fertile as it had been and also that their cattle were dropping their young prematurely. They were very much concerned about this and they called for a committee of inquiry.

This committee of inquiry found that there was an intensive production of muriatic acid, (hydrochloric acid), in that region, and that the fumes and the waste products were doing this damage.

This was scientific objective evidence presented to the politicians of the time. They were very powerful in those days, Mr. Chairman, because this report, which in these days would take years, was prepared in twelve weeks.

Senator Lang: There was economic orientation there.

Mr. Goldsmith: Yes, their property was being threatened rather radically. Now, as a result of the Alkali Act, it was agreed that a civil scientist shall be appointed a commissioner to supervise and have a look at what was happening generally with this kind of environmental pollution. This seems to me an excellent example of the way in which objective scientific advice is considered by politi-

cians, and then used by politicians, to make a decision in the interests of the community. This is all that I am suggesting now, in a much more complex field where it is not only a particular field that is being polluted but a whole environment, and not only physically but also mentally. I would hate to be a politician at the present moment. The responsibilities are too great.

The Chairman: I wonder if you would give us some of your views on the general evolution of science policy in the socialist countries?

Mr. Goldsmith: Ah, that is a difficult one. The science policy in the socialist countries, is, of course, obviously linked up with a sort of dominant political party view, that is, as I quoted Kosygin earlier on, that science is important. They have a very vast program within all the socialist countries for the popular dissemination of science. In other words, they want an immediate feedback from people or an acquiescence and agreement by people that science is important.

So they have tremendous programs, and I do not think that there is any distinguished scientist in any of the socialist countries who is not involved as an officer of either a national or regional grouping for the popular dissemination of science and who goes out and gives lectures.

This is a very important factor in getting, as it were, a scientific and technological temper within a country.

So far as science policy is concerned, this stems of course from the communist view that society has to be planned. What is interesting is that the socialist countries, as have the non-socialist countries, have taken up the science of science approach in quite a remarkable way.

In the Soviet Union, I know that there is a tremendous amount of work being done on basic research in the science of science, because what the Russians want to do is to discover whether there are any internal laws of growth in science and technology and, if there are, to apply these. They are doing an enormous amount of head counting in this field and there are federal units, such as the one at Kiev, which are really spending large sums of money, so far as any other country is concerned, including even the United States in doing these basic studies. In the SSF newsletter, which is read around the world, we have

published a report on the multifarious activities there in the science of science.

I hope you will forgive me, Mr. Chairman, if I do not really answer in full your question on the science policies in socialist countries, because this would then demand a look at the kind of machinery that they have set up and I am afraid I could not give you this unless I really went and had a look at my own sources of information again. But there effort is linked up with a determination to deploy science and technology in the interests of the community. There is not all that much wise employment all the time, but there it is.

The Chairman: Is it not true that, at a certain stage, their research and their science effort was closely associated with the academies and was a kind of higher-level exercise, and that there has been a tendency recently to link this effort much more closely with economic growth and social well being?

Mr. Goldsmith: Yes, indeed. The academies of course, have always had two kinds of programs; one, programs for what they call basic research—and I think that they are very traditional in this regard, they are prepared to spend any amount of money on basic research. They believe this is important. They believe that in basic research the factor of chance is very important and that something may come along which, if it pays off, will take care of all the money spent. In addition to that, the programs of the academies of science and the various institutes are linked to the national goals as expressed in the official party program. In Czechoslovakia, for example, Academician Sorm is not only President of the Academy of Science and head of his own Institute, being a chemist, but also he is a member of Parliament and a member of the Central Committee of the Communist Party. Such an individual is extremely powerful. It means also that any decisions taken at the political level are in some way interpreted and passed on.

The Chairman: So they have ministers of science there?

Mr. Goldsmith: In some form, yes.

Senator Robichaud: I should like to return to the statement referred to by my colleague Senator Bourget. You said that in the end the decision must be political, and we understand that. In your judgment, which would you

think would be more effective or more practical, a single minister, a minister of science or scientific affairs responsible for science, or a committee of ministers whose departments are involved in research and science? Which of the two would you think would be more effective?

The Chairman: Why not both?

Mr. Goldsmith: You have me! I just do not know what the answer is. I think this is the kind of thing one requires to look at with a rather deep inside knowledge of the political scene. The appointment of a minister, whether he is concerned with science or anything else, is a political appointment and has political significance. The setting up of a department again in terms of the government's general program is a political decision and I do not think general theory is really very meaningful here.

Senator Robichaud: Is it not a fact also that the final decisions are very seldom left to a single minister?

Mr. Goldsmith: I have never been a cabinet minister so I do not know.

The Chairman: To pursue this, without trying to bring you down to the Canadian situation, is it not true that all countries, including the United States and Canada, all countries that have a relatively important science effort, have some kind of minister with a special responsibility? I agree there is a lot of variation from Great Britain to Germany, from Germany to France and to Japan.

Mr. Goldsmith: Yes. The OECD calls meetings of ministers of science from the OECD member countries. They may be either ministers of education who have a direct responsibility, or ministers of industry or ministers of technology. Obviously there is an individual somewhere, but what his exact role is will, I think, depend very much on national political and cultural characteristics. Certainly somebody exists somewhere. In Britain we set up a Department of Education and Science, which concerns itself with basic science, and separated applied science from this in the Ministry of Technology. I think there ought to be the most intimate links between basic science and applied science. If one is concerned with basic science as a cultural good in the same way as, say, the arts and humanities are

cultural goods, quite clearly we must spend money on basic science as a cultural good. To separate off basic science from applied science raises a problem, but it resulted because of the particular needs which expressed themselves in Britain at that time.

The Chairman: Probably also because the central government in Great Britain is responsible for education as well.

Mr. Goldsmith: Yes.

The Chairman: Since basic science is mainly done in universities the two were conceived to be complementary to one another.

Mr. Goldsmith: That is absolutely right.

Senator Kinnear: I noticed that you said science and technology will unite to help mankind, or words to that effect. I think that is very important. Probably through science and technology we will never run into a manpower situation such as we had in 1929 and the thirties. I wonder if you would agree that that is part of your work?

Mr. Goldsmith: I think the whole point about the development of a national policy is the fact that, as expressed in Report No. 4 of the Science Council, once you begin to postulate national goals, clearly you begin then to organize a program to insure that you have the right kind of manpower available to meet your national goals, and even though these may be short term, it is still a term which allows of the production of the right people, so there is not any wastage. I think in terms of a national program of this kind declared objectives of national science policy will make a considerable difference.

Senator Bourget: In your opinion should there be some relation between the amount of money spent on R & D and the GNP?

Mr. Goldsmith: Well, we know there is no clear direct relationship. I suppose there is some causal relationship, but it is a bit obscure.

The Chairman: It is certainly not a current relationship.

Mr. Goldsmith: You know the position with regard to Britain. I have forgotten the figures, but Japan and Germany are spending much less but are getting a much bigger payoff than we do in Britain. We ought to have

some basic studies on this. This really requires to be looked at very carefully. It also depends on the definition of "innovation". If innovation includes R & D, one has to look at the whole innovation spectrum and see what allocations require to be made. One of the things we require to look at is the extent to which basic research in itself requires to have money spent on it regardless. I remember that one quite distinguished scientist in Britain said, "I would spend all the money that we are spending now nationally on everything on basic research." This is a gross overstatement, because of course he did not mean it. I asked him why and he replied, "We will get such pay-offs and such break-throughs that we will astonish the world with the fertility of the things we discover." They may or may not do so, but this does mean that we require to have special studies done on this particular aspect.

The Chairman: In other words, we are quite sure that science and technology may have a great influence on growth?

Mr. Goldsmith: Of course.

The Chairman: Of course, the invention of the steam engine really determined the whole development of Great Britain, for instance, perhaps more than any other factor in modern history in Great Britain.

Mr. Goldsmith: Yes, the steam engine of course is the spirit of managerial enterprise which existed in those days. I think this is

terribly important. That is to be able to take a process and diffuse it very speedily. This is a key factor the Americans specialize in.

Senator Carter: Have you any suggestions or do you know of any experience in other countries where they have developed some sort of criteria to determine when basic research on a certain line should be discontinued?

Mr. Goldsmith: Again this requires special studies. You know, once you start a project, it is very difficult to know when to stop it.

Senator Lang: We stop them here pretty easily.

The Chairman: Even before they start. So perhaps in this respect we may be more efficient than others.

Mr. Goldsmith: Yes. If you do not do anything you are highly efficient.

The Chairman: Any other questions? Before drawing this meeting to a close I would like again to thank you very, very much for spending this afternoon with us and to give us your views so frankly, even in respect of Canada and even if you have not been in Canada for long, beyond this recent trip. Again, thank you very much on behalf of the members of the committee and on my personal behalf.

Mr. Goldsmith: Thank you.
The committee adjourned.



First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

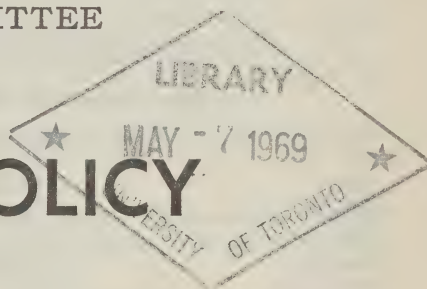
PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*

The Honourable DONALD CAMERON, *Vice-Chairman*

No. 36

THURSDAY, MARCH 6th, 1969

WITNESSES:

TREASURY BOARD: S. Simon Reisman, Secretary; J. L. Fry, Director of Economic Measures and Scientific Research Division; and Bruce McDonald, Director of Planning and Analysis Division.

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,
The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,
The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

THURSDAY, March 6th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Carter, Grosart, Kinnear, Lang, McGrand, Robichaud, and Yuzyk—8.

Present but not of the Committee: The Honourable Senator O'Leary (*Antigonish-Guysborough*)—1.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

TREASURY BOARD:

S. Simon Reisman, Secretary;

J. L. Fry, Director of Economic Measures and Scientific Research Division; and

Bruce MacDonald, Director of Planning and Analysis Division.

(*A curriculum vitae of each witness follows these Minutes.*)

At 12:35 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Reisman, S. Simon. Mr. Reisman was born in Montreal, Quebec. He received a B.A. in Honours Economics and Political Science from McGill University and an M.A. from the same university in 1942. In 1945, he attended the London School of Economics. In 1942, he joined the Canadian Army and served overseas with the Royal Canadian Artillery. He returned to Canada in 1946 and joined the Civil Service with the Department of Labour. He transferred to the Department of Finance that year and in 1954 was appointed Director of the International Economic Relations Division. From 1955 to 1957, he was Assistant Director of Research on the Royal Commission on Canadian Economic Prospects. Mr. Reisman is the author of "Canada-United States Economic Relations" which was prepared for the Commission in 1957. In 1957, Mr. Reisman was appointed General Director of Economic and International Affairs in the Department of Finance. In 1961, he was named Assistant Deputy Minister for Economic Affairs, Industry, Tariffs and Trade in that department. In July 1964, Mr. Reisman was appointed Deputy Minister of the Department of Industry. Since 1947, Mr. Reisman has served as a Canadian delegate in various international economic, tariff and trade conferences and has also participated as a negotiator for Canada in numerous trade agreements, including the Canada-U.S. Automotive Agreement and the recently concluded Kennedy Round of tariff negotiations at Geneva. In April 1968, Mr. Reisman was appointed Secretary of the Treasury Board.

Fry, James Lawrence. Place of Birth: Hartney, Manitoba. Date of Birth: July 6, 1927. Education: High School—Hartney, Manitoba University of Manitoba—B.A. 1948 University of Toronto—M.A. 1950 Political Science. Employment History: Joined the Federal Government in 1950 as a Junior Administrative Officer, assigned to the Department of Finance, Comptroller of the Treasury. Held various posts in this Organization finishing in the fall of 1956 as Establishments Officer for the Comptroller of the Treasury Organization. Fall of 1956 joined Treasury Board as a Group Chief and have been employed by Treasury Board since that time, becoming a Director of the Program Analysis Branch early in the 1960's. At present, Director of the Program Analysis Division responsible for Economic Measures and Scientific Research Departments.

Macdonald, Bruce A. 1950—Carleton University, Bachelor of Commerce (economics and mathematics). 1954—Master of Arts (Mathematical Statistics and Economics) Columbia University. 1951-56—Economist and Statistical Adviser, Economics Branch, Department of Agriculture. 1956-60—Chief, Data Processing Section, Department of Agriculture (computer applications for agricultural research, production and marketing and general administration). 1960-66—Director, Planning and Development Branch, Office of the Comptroller of the Treasury. Directing division concerned with data processing,

work measurement and organizational analysis, and accounting systems analysis. November, 1966—Director, Planning and Analysis Division, Program Branch, Treasury Board. Directing a division responsible for the technical development of the government's program budgeting system, the promotion of cost-benefit and systems analysis, and the analysis of patterns of government expenditures.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, March 6, 1969

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (*Chairman*)
in the Chair.

The Chairman: We are very grateful to Mr. Reisman for having accepted to be with us again this morning. I suppose that we will go to the questions immediately. You do not have any addendum to make since you were with us?

Mr. S. Simon Reisman, Secretary, Treasury Board: That is correct, Mr. Chairman. I have said what I have said and probably exhausted what I know, so you can test me now.

Senator Carter: I apologize because I do not think I was able to be present at the last meeting. The question I am asking may have been already answered at an earlier meeting; if so, then there is no need to go into detail on it.

On page B-1 you have a diagram showing the Prime Minister and you go down the line to the Cabinet; then from the Cabinet you have over on the right a Chairman of the Committee of the Privy Council on Scientific and Industrial Research. Down through him the National Research Council, then Canadian Patents and Development Limited.

Just how does this Chairman of the Scientific Committee function? Does he do any co-ordination, or does he just evaluate what is going on in different departments and report back to the Cabinet? Does he exercise any influence on priorities of projects?

I would like you to explain a little more fully just what is involved in this function of the Chairman of the Committee of the Privy Council on Scientific and Industrial Research and how that would relate to a Minister of Science Policy, if we had one?

Mr. Reisman: Mr. Chairman, I am not an expert on the apparatus of the Cabinet com-

mittees and Cabinet committee structure. I do have a general familiarity with this committee for several reasons: one, the present Chairman of the Privy Council Committee on Scientific and Industrial Research is the Honourable C. M. Drury and he has been Chairman of that committee for quite a few years, first in his capacity as Minister of Industry. He kept that position as Chairman of that committee when he became President of the Treasury Board.

Since I have served Mr. Drury for the past five years, both as Minister of Industry and as President of the Treasury Board, I have some familiarity with it, although it is not in the general line of my duties. As Deputy Minister of the Department of Industry before I took my present post, I was a member of the Officials Committee which worked under the direction of this Cabinet committee and prepared a good deal of the background work and the preliminary examination of subjects which were to come up on the agenda of this committee. This is how I had a relationship to it.

It is a Cabinet committee established by law; I believe it is the National Research Council Act which set up this committee and I believe there are only two committees of the Cabinet that are established by law: one is this committee and the other is the Treasury Board. All the other committees are established as part of and *ad hoc* working arrangement. This one has this formal status as a committee of Cabinet; it derives its authority from the Cabinet.

The Chairman: Like Treasury Board?

Mr. Reisman: Like Treasury Board; its deliberations would form the subject of a report to the Cabinet. It would be the government itself that would be taking the decision; this committee in the period that I had some

contact with it usually confined its meetings to dealing with major program issues.

The Chairman: Major new programs?

Mr. Reisman: Major program issues, new program issues and in that context.

The Chairman: I am just quoting the minister to you, you see, because Mr. Drury, I am sure you have noticed this, has made a statement recently that this Cabinet committee was not dealing with general policy but was dealing only with new programs.

Senator Carter: Would that Cabinet committee make any decisions or recommendations with respect to priorities when there is a conflict between one department and another, and did this committee have anything to do with the cancellation of the telescope out on the west coast somewhere?

Mr. Reisman: I am trying to recall, sir, just what committee of Cabinet looked at the whole telescope situation. Speaking from memory, this particular committee did on several occasions deal with the telescope, but so did other committees of Cabinet on other occasions.

Mr. L. Fry, Director of Economic Measures and Scientific Research Division, Treasury Board: I think the main decision was the Priorities Committee's; I do not think that the Industrial Committee met more than once, if it met at all, on the telescope.

Senator Carter: Would that decision come back to Cabinet through the Chairman of the Committee on Scientific and Industrial Research, or come back directly from the Priorities Committee, which is not established by law, I gather?

This one, as you pointed out, like the Treasury Board, is one of two Cabinet committees which are established by law and apparently have certain powers vested in them by law.

Mr. Reisman: I think that Mr. Fry, who has just made a comment on this and has refreshed my memory on it, is quite correct, that on the occasion of the examination of the telescope project from the point of view of whether resources should be allocated to it was last examined—I should not say was last examined, on the occasion of that major decision it was the Priorities and Planning Committee of the Cabinet, which is the committee

concerned with priorities, that examined this and then reported to Cabinet.

The Chairman: And in the case of ING it went to Treasury Board and the Cabinet?

Mr. Reisman: In the case of ING it also was discussed in great detail before the Priorities and Planning Committee; it was examined by the Treasury Board; it was examined by Priorities and Planning; it was examined again by the full Cabinet.

Senator Grosart: Are you saying, sir, that these two scientific decisions did not go to the Cabinet Committee on Science and Industrial Research?

Mr. Reisman: What I am saying is that of the meetings of this committee which I attended neither the telescope nor the ING proposition at the time they were looked at in terms of priorities was examined by this committee, but I am not a member of this committee at the present time. I am not privy to all the documents and discussions that take place in this committee, and I think if you wanted to know more about this committee, its agenda and what subjects it has covered over the last period of time you would really do better to invite as a witness the chairman of that committee or the secretary of that committee and he might be able to give you more information.

I can tell you that several years ago when I was with the Department of Industry this committee met on some major matters of scientific programs.

Senator Grosart: Is this the Priorities Committee?

Mr. Reisman: No; the Priorities and Planning Committee is quite a new committee.

The Chairman: I believe that it was established after the last election?

Mr. Reisman: As a matter of fact it was established prior to the last election; if I am not mistaken it was established probably about 14 or 15 months ago, in the closing months of the Pearson administration. Then it became much more active following the election.

The Priorities and Planning Committee is, as its name indicates, a very key and central committee of the Cabinet, dealing with priorities as its name implies.

Let me add something here. Matters arising on a number of committees of Cabinet when they involve questions of priority will appear on the agenda of the Committee on Priorities and Planning after having been considered by a particular functional committee of the Cabinet.

The Chairman: It is a kind of super committee.

Senator Grosart: But would you not agree that everything that comes before every committee of Cabinet involves priorities as to spending?

Perhaps I should not ask you to answer that, because it is probably in the policy field.

Mr. Reisman: No, it is a reasonable question, Senator Grosart. I think that it is a fair statement that a subject appearing on a committee of Cabinet that involves the expenditure of funds, that any discussion about that in a sense involves discussion about priorities. These functional committees will look at spending problems in relation to the sort of subjects that appear before that committee. The one committee that can look at expenditure questions from an overall point of view I think, as the Chairman indicated a sort of master committee looking at the total picture and being able to relate expenditures related to one function and expenditures in other functions is the Priorities and Planning Committee.

The other two bodies that are able to look at expenditures from that point of view are the Treasury Board and, of course, the Cabinet as a whole.

Senator Carter: I can understand your Priorities Committee making a decision as between priority given to a scientific project or to a nonscientific project, but when it comes to priorities within, choosing between one scientific project and another, is that to be carried out also by the Planning Committee, or is it to be carried out by the Committee on Scientific and Industrial Research?

Mr. Reisman: Sir, you are raising a question which perhaps I can comment on in a manner that will throw a little light on this whole question: Perhaps I can best do this by choosing an example.

Let us take this whole subject of satellite communication; as you know, the government has taken a decision and has made announce-

ments about a major project to construct the satellite, to get it up into space and, through it, to enlarge, elaborate and develop a major new, highly scientific communications system in Canada.

How is such a project to be looked at? Is it to be looked at as a scientific project? Is it to be looked at as a communications project? Is it to be looked at as a national project concerned with nation building and unifying the country? How is it to be looked at?

What I tried to indicate when I appeared before your committee, sir, several weeks ago, was that at least from the way that I look at the problem scientific research, scientific activities to be understood at least in accordance with my way of looking at things, should be seen as an instrument together with other instruments for achieving certain goals and objectives. In the case of communications, which is one of the very high technology and high scientific based fields, any project dealing with communications will inevitably have a very considerable scientific research and development and innovative content to it. The project was initiated not for science's sake; it was initiated for the sake of developing a good communications system, for helping in the process of nation building, helping to unify the country.

Science inevitably would form a very substantial component of that whole project. I would ask you, sir, although I am not permitted to ask questions here, but I would simply pose a theoretical question as to how one should approach such a project? Should one say, now in the interests of science we should be building a communications satellite and casting it up into space? Or should we look at it the other way, that from the point of view of communications or whatever your objectives are we should be developing this as a national project, and of course it will have a high scientific content?

There is your dilemma in terms of how in conceptual terms one examines this sort of thing.

The Chairman: It is not always that kind of dilemma though, because you have chosen a very good example to suit your own theories, but if you look at ING or if you look at the telescope, then the situation is much clearer.

Senator Carter: I was going to say that I would not regard the illustration that Mr.

Reisman used as being parallel or even related to the question I posed, because putting up a satellite for communications is not much more difficult from installing a telephone. You are using technology that has already been developed and while some more developments may come from it, yet what you have done is accept it and the technology is available at the moment and you are putting it to a use. All these other things flow from that, but if you come to the heart of the question you are in a totally different situation. It is that kind of situation when you choose between one scientific project and another.

I do not see that the satellite was in conflict with any other scientific project as a scientific project; it may have been in conflict with whether you should build another highway somewhere or not.

Senator Lang: Or the PEI causeway.

Senator Carier: Or the PEI causeway, but not in conflict with another scientific project; that is the point I was trying to make.

Mr. Reisman: Mr. Chairman, I would like to comment on this: First, let me say that in making my observation I obviously believed that it was highly relevant to the question and I still believe that it is highly relevant to the question. Let me tell you why: It is not correct, sir, to say that that project is based on an established, well known state of the art; there is a great deal of scientific research of a basic kind, of an applied kind, and of a developmental kind that will have to be carried out, involving very large expenditures in connection with this operation. Indeed the new Department of Communications will have a very considerable scientific wing. I think the senators are familiar with the Organization Bill which is before Parliament at the present time and which in this question envisages the movement over to the Department of Communications of a very considerable number of scientists in this field of communications, satellite communications in particular, who had been attached to the Defence Research Board but who in their work had conducted a great deal of I might say almost pure research and also applied research in communications work. They are the group that built the Alouette and the Isis I and are working on the Isis II.

It is interesting because a good deal of the research in communications, which is only

partly oriented research, is the basis on which it is possible for a country like Canada to even contemplate going into the satellite communications business, but there is a great deal of science that continues to be done. There were a number of questions put that I think we should explore a little and that is that kind of project as compared to other projects which are more science oriented in terms of their original intent and purpose, but in response to this specific question I could perhaps comment on that too.

Senator Grosart: I am not directing a question to you, Mr. Reisman; I would just like to say to the Chairman that surely it is incredible that the ING and the BC telescope decisions were made, if they were made, without any reference to the Committee of the Privy Council on Science and Industrial Research. It would seem to me that the Priorities Committee, which is another committee of Cabinet, would look to the other committee for assessment and even advocacy just as they would look to the Treasury Board, which is another committee of Cabinet, for an assessment and advocacy or the opposite in terms of financial resources available.

This seems to me, Mr. Chairman, to perhaps go to the heart of the problem of the whole ING and telescope decision, that the committee which surely had the function of sorting out the scientific priorities within the billion dollars which we are going to spend on science research, surely that committee should have been alive at that time.

I do not want you to comment on that.

Mr. Reisman: I can if you want me to, sir.

Senator Grosart: Go ahead.

Mr. Reisman: First I want to be very clear on this: I did not say, and I do not think you said I said, that the Privy Council Committee on Scientific and Industrial Research did not examine the ING and did not examine the satellite; I did not say that.

Senator Grosart: No.

Mr. Reisman: In fact, if you asked me to make a guess about this, I myself as I said was a member of the staff supporting committee of this committee and at that time I was privy to all the work that went on in this committee for an interval of time.

The Chairman: I am sorry, but perhaps I misunderstood you: I got the impression, and this is good to clear up immediately for the record, when you were speaking about this, that the ING had not gone to the committee.

Mr. Reisman: No, I want you to be very clear about that, Mr. Chairman; I did not say that.

If you ask me to guess about that, I would say that at some time or other both the telescope and the ING were examined by this Privy Council Committee on Scientific and Industrial Research; I am not certain.

Senator Grosart: Mr. Chairman, I think the misunderstanding arose this way, that Mr. Reisman referred the question to Mr. Fry and asked Mr. Fry what committee it went to and Mr. Fry, as I recollect, said it went to the Priorities Committee, but it is true that he did not say it did not go to the other.

Mr. Fry: I think I said that it probably went once to the other committee, but it was Priorities Committee that made the decision and the recommendation to Cabinet.

Senator Grosart: Perhaps we can find out if it did go to the other committee?

Mr. Reisman: I want to take this a little further: If you want to know about the agenda of this committee, as I indicated I think you ought to call other witnesses who are better informed on that subject.

I do know that many subjects came before this committee and I would be almost sure that at some time or other both those subjects ING and the telescope, were looked at by the Privy Council Committee. I know for certain that both of them were looked at by the Treasury Board; I know for certain that both of them were looked at by Priorities and Planning; I know for certain that both of them were examined in great detail by the Cabinet. But having said that, I think I should add something else and say this, that in all my experience in government, which is now running to about a quarter of a century, I have never seen a subject examined so thoroughly and with so many resources applied to it.

The Chairman: I do not think that there is any criticism about this.

Mr. Reisman: And the ING project. There were numerous meetings of numerous committees; there were numerous ministers who

addressed themselves to it; there were many, many professionals, both inside the public service and outside the public service; there was documentation that stands at least that high; there was a thorough-going examination of this.

Indeed, I would venture the opinion that if all subjects that come before government are examined with that thoroughness and that care we would have occasion to be very proud of the way in which decisions are taken.

The Chairman: Or the government could come to a standstill.

Mr. Reisman: That is your comment, sir. This government is really quite capable of carrying on a great deal of intensive work on many subjects; it is amazing.

Senator Lang: Mr. Chairman, I cannot help but agree with what the witness says there. I think that where the credibility gap arises as far as the public is concerned is not a decision of whether we should proceed with ING or we should build a telescope, but that we should decide to do so and then shortly thereafter decide we should not do so. It is the reversal of position that brings into doubt the competency of the governmental structure; it is not the decision-making, it is the reversal of decision-making within a very short period of time.

The Chairman: I would prefer, senator, for you to keep that question for a little bit later on, because I think that we were on quite an important track that I would like to finish before we go to this. We were really dealing when Senator Carter asked his original question with the process of decision-making and the role of that special Cabinet committee in it.

As far as I am concerned, I would like to ask another question in relation to that once others have had the opportunity to put questions in that field, on that aspect of our problem, then you can come back with your question.

Senator Lang: I will take your position at face value, Mr. Chairman, for the moment.

Mr. Reisman: I would like to speak on a point of fact only and then we can let it drop.

The Chairman: I do not want to let it drop, but to drop it temporarily.

Mr. Reisman: The honourable senator made reference to the fact, to the alleged fact, that a decision with respect to ING had been taken and then reversed; this is not correct.

Senator Lang: In either case?

Mr. Reisman: This is a subject in connection with ING with which I am thoroughly familiar; I know as a matter of fact that a decision of government had not been taken. There were decisions to do some preliminary investigations, to do some feasibility studies, to have some examinations made, but the decision to proceed with that project as a project was never taken.

Senator Carter: Are you talking about ING or the telescope?

Mr. Reisman: I am talking about ING; I am not talking about the telescope.

In the case of the telescope, the fact stated by the honourable senator is correct, but with respect to ING it was not correct.

Senator Grosart: Except that there was a decision that was reversed, Mr. Reisman, to support Senator Lang's position. Although the first one was not a government decision it was a decision in effect, a recommendation anyway, a strong recommendation, a recommendation that could hardly have been stronger by the Science Council and by the working paper of the Secretariat.

I think this is what Senator Lang refers to, that the public assumed that when we had set up a Science Council and it recommended an expenditure of \$7½ million in that particular year that the government would go ahead.

Mr. Reisman: With respect, sir, if I can be allowed a comment on fact again. With respect, Senator Grosart, on the matter of ING and I think the evidence is there for all to see and the reports can be turned up, the recommendation made by the Science Council, and I was a member of the Science Council at that time, an associate member of the Science Council and still am, was not a clean-cut recommendation. It was a recommendation that was hedged by a considerable number of qualifications. Indeed, even in its final form, in its most articulate form, the advice was conditioned by a requirement that it be reviewed after certain feasibility work had gone forward.

There was never a clean-cut recommendation on this from the Science Council of Canada; there is no question about that.

Senator Grosart: It depends what you mean by clean-cut, Mr. Reisman; I do not want to argue this thing indefinitely, but when the Science Council and the Secretariat working paper starts to talk about exciting new horizons, scientific horizons that this will raise, they may have made qualifications, they make many qualifications, but what I am saying in support of what Senator Lang said is that the public reading those two reports were entitled to think that the main science advisers to the government were very enthusiastic about this and suggested it should proceed.

I would suggest to you that the reservations related not to the \$7½ million but to the \$150 million. The thing that is incredible to me about that decision and again I make my position clear and say I also find the Arrow decision incredible, what is incredible to me about it is (a) that the decision was announced in an almost casual way in Calgary and not in Ottawa, and the Arrow decision was about as casual, but the incredible thing is that these feasibility recommendations were not carried out, for purely financial reasons as the Prime Minister said. He gave two reasons: one was the financial stringency, which we all understand; the other was really the letters to the paper when it boils down to it, the Associate Dean of Engineering, and so on.

I just say it is incredible to me.

The Chairman: This is a matter for the record; I would like to pursue the first line of questioning.

I think that to go back to your point, Senator Grosart, if I can say so as Chairman, I do not think that you finally came back to Senator Lang's original point, because I think, if I remember correctly, Senator Lang was saying that there had been a decision; you say that there was almost unanimous advice, which is not the same thing.

Senator Lang: I will confine my references to the telescope.

The Chairman: In relation to this Committee of the Privy Council on Scientific and Industrial Research you referred originally to a kind of committee of officials serving and presumably advising that committee. Could you say a little bit more about this committee of officials?

Mr. Reisman: I think to understand the work of the Privy Council Committee on Scientific and Industrial Research in recent years one has to reflect and examine the very important changes, innovations and adjustments that have been taking place in the last number of years in the whole apparatus of government with respect to scientific matters.

As you know, the establishment of a Science Secretariat in the Privy Council office is a relatively recent innovation; it is only a matter of a few years. The creation of a Science Council of Canada is a relatively recent innovation. The whole process of committee structure under the Cabinet has undergone major changes and development in the last several years. The whole staffing support and technique for examining problems at the Cabinet level and in bodies related to the Cabinet has undergone very important changes in the last number of years.

Senator Grosart: But it is so that the Science Committee of the Cabinet has been going since 1916. I will not say going; it was established in 1916.

Mr. Reisman: It is correct, sir, that the National Research Council Act of many years ago established this Committee, but in matters of institutions as in matters of life generally there is change and evolution and adaptation to changing needs.

This is no less true of that Standing Committee of the Privy Council than it is of many, many other institutions. I know this to be so because at the time that I was Deputy Minister of the Department of Industry major questions about organization in this and in related fields took place. At one stage the major inputs in connection with the work of the Privy Council Committee on Science and Industrial Research came from the National Research Council. There was I think for many years a committee of officials presided over by the President of the National Research Council that examined matters which would later be placed on the agenda of the Privy Council Committee on Scientific and Industrial Research.

The Chairman: This was a very important aspect of the responsibilities of NRC because that committee, as you know, as a matter of fact never met really, at least up until recently.

Mr. Reisman: That is right. And with the establishment of the Science Secretariat ques-

tions arose as to how the Privy Council Committee could be best served and after long deliberations a decision was taken that the head of the Science Secretariat in the Privy Council Office would be the Chairman of that supporting staff committee. This seemed to be a reasonable thing to do by virtue of the fact that the National Research Council itself was a major operating scientific agency and there were many other such operating agencies. The new Department of Industry itself had launched a number of important programs in the field of industrial technology. So the composition of those committees, the chairmanship of those committees, the secretariat for those committees, were all adapted to reflect the changing emphasis and I might say the growing emphasis on science and policies of the government in respect to science within the governmental framework.

So there were very big and important changes that were taking place and I suppose it is correct to say that during the period when this evolutionary process was taking place and this adaptation of institutions was taking place that these committees were not meeting as frequently as one perhaps might want them to meet on matters of substance. The fact that an institution is evolving and adapting to the changing needs, to my mind anyway, is not a reason why it should be cast out in favour of some other untried institution.

If an institution is not working the way you want it to work, change it and make it work the way you want it to work; do not create yet new institutions that are untried, untested, and who knows, they may be even worse than the ones that you put aside. I think it is really in that kind of context that one might examine some of the existing institutions in the scientific field.

The Chairman: To come back to my question, would you describe this committee of officials as to its composition? I understand that you just told us that the Director of the Science Secretariat is the Chairman of that committee?

Mr. Reisman: Yes; when I was a member of that committee as Deputy Minister of Industry the Chairman was the Director of the Science Secretariat and the membership,

although I do not know if I can give you a comprehensive list, comprised of those departments and agencies of government that were active in the scientific field or that had programs for the encouragement of science. That would have taken in the National Research Council, Defence Research Board, Department of Energy, Mines and Resources, the Department of Agriculture, the Department of Fisheries and Forestry, the Department of Industry, and I dare say there are one or two others.

Senator Carter: May I put in a supplementary question there, Mr. Chairman: Was there any special reason for making the Science Secretariat an adjunct of the Privy Council office rather than of the Committee on Scientific and Industrial Research?

I understand that probably this question should be put to somebody else, but as far as your knowledge goes?

Mr. Reisman: This, senator, is a reasonable question: The Treasury Board, I think by statute, has a responsibility for organization of government and all its parts, and from that point of view I should be able to make some kind of comment and I hope an intelligent comment on this.

The structure of the Privy Council Office, and it may well be, sir, that you may want to have a witness from that central agency, has on its staff, it is not a large staff but has on its staff people with competence in a variety of disciplines. They are there to assist the Cabinet and to assist the Cabinet committees in their deliberations. It has been evident from the earlier remarks that a considerable number of important subjects with a high scientific content come before Cabinet committees and come before the Cabinet and it was considered desirable to have added to the staff of the Privy Council Office a small group with a competence in these fields.

The servicing of one of the committees of Cabinet which happens to be a standing committee, a committee established by statute, is really no different from the job of the Privy Council Office in serving any other committees. This happens to be one of the functional committees and a statutory committee, so it seems to me entirely in order that one would look to the Privy Council Office and its various emanations and components for servicing and support to Cabinet and committees of Cabinet of which this is one.

This Science Secretariat when it was first created had a variety of functions. One of the functions was to support this statutory committee. Other functions were to give advice on all scientific matters that came before Cabinet and in addition when the Science Council was created they were also given the task of providing the professional and secretariat services for the Science Council of Canada.

As you know, there is a bill before Parliament right now which provides the Science Council of Canada with a secretariat of their own. I think a considerable part of that secretariat will in fact be drawn from the Science Secretariat of the Privy Council Office.

Senator Carter: Do you think that will disappear then?

Mr. Reisman: No, sir; what has really happened is that they have taken the Science Secretariat and they have split it into two parts; one part will perform the functions which I described a moment ago, to serve the Cabinet and Cabinet committees internal to government, to conduct studies on request, and to advise generally on these matters.

The other part will serve the Science Council of Canada; the Science Council of Canada would then be in an advisory role concerned with not only science in government but with science in the nation generally. They would be an independent body; they would not be an operating body; they would not be a policy-making body; they would be an advisory body and they would advise and recommend on all matters.

The Chairman: And they will serve the Science Secretariat as well?

Mr. Reisman: I do not know whether I have put it quite that way, sir. They will be producing reports; they will be doing studies; they will be making investigations, and they will be presenting reports to the public generally and to government.

Now, when they present a report to government the people inside the government who are competent to look at these reports and advise on them will be found in a number of areas, but especially in the Science Secretariat. If the Prime Minister or the

Chairman of the Privy Council Committee on Scientific and Industrial Research wants to know about the last report on the Science Council, he will very likely turn to the Science Secretariat and say, well, gentlemen, what is in that and how does it fit in with other things and can you give us an abstract and some advice on it? They will be doing that job.

The Chairman: It seems to me that this is an important aspect of our investigation, and we will have to decide among ourselves whether we should hear from witnesses about this, especially the Clerk of the Privy Council, Mr. Robertson and/or Mr. Drury.

Senator Carter: My other question is way back in the other part of your brief, pages 49 to 54. You give an illustration of the decision-making process there; you have two alternatives, system A and system B. Then you work out the cost benefit ratio and come to the conclusion on page 54 that when you have to choose between B and A the breakeven point comes after 40 years. After that the cost benefit ratio for B is much greater and much better than for alternative A, but it takes 40 years to accomplish that.

I presume you infer, although I note you have qualified this by saying you have oversimplified the problem, but the question in my mind is this, that if the inference is, if the deduction is that the decision would be in favour of alternative B, which is going to take 40 years to break even, where are you making any allowance for technological advances that are going to occur during those 40 years, because up to 40 years alternative A is better?

It seems to me that if I were making that decision I would plump for alternative A on the assumption that within 40 years they will both be obsolete and you will have something much better to provide.

Mr. Reisman: Senator Carter, a cost benefit analysis is rife with problems and a wise man would approach cost benefit analyses with many, many qualifications. I would not dispute and I would not argue with what you have said.

This is an example given for illustrative purposes; it may well be that looking at alternatives A and B and the illustrative example, the sort of considerations that you have just raised, namely the introduction of assumption about changes in technology, could well lead

you to the alternative which did not look as good if you took the very long term but looked safer in the short term if you made the assumption that there was a good prospect that technology would change the situation. There is no question about that; cost benefit analysis has nothing magical about it. What it tells you, and it has got all kinds of fancy language, but what it says to you is that in examining alternative courses of action you really ought to try to do your homework, do your bookkeeping, try to quantify the choices and see whether in fact you can come to good decisions on the basis of that kind of analysis.

There are many, many problems, particularly in the government sector, which do not lend themselves to this kind of quantitative analysis. If one were to ask one's self, let us say, that the objective one wants to reach is the unity of Canada over the long term and one examined various ways of moving in that direction, I defy anyone to take that kind of problem and put it into quantitative terms and determine your choices on that basis.

The Chairman: Or the cost of separatism.

Mr. Reisman: Or the cost of separatism.

Senator Carter: This is an illustration though in your own brief as to how decisions are arrived at and it seems to me that I would not make decisions on the basis of the assumptions that you have quoted. I would not make the decision which you arrived at in your brief.

Mr. Reisman: This, Senator Carter, is on the basis of the interposition of an assumption about technological change. Now, it may well be that in this particular area one could make some rather more concrete assumptions about technological change. Let us take a specific example: Let us take the case of Ontario Hydro, which currently has to take decisions as to whether to build a power capability, whether to expand their hydro capability by a variety of means available to them. They can either build thermo stations, using coal; they can build nuclear stations; or they can perhaps make a deal with Manitoba in connection with the development of the Nelson River. These are all different ways of expanding the volume of power that they have access to.

Now, in that example I do not think there is much question that if one looked at the very short term the thermo station approach

might look more attractive, having in mind that it requires less capital. If one looked at the longer term, namely a period long enough to amortise the very heavy capital requirements of a nuclear station, the nuclear station would look like the more attractive one.

Senator Lang: And the time it would take to get it into operation.

Mr. Reisman: All right; now, they look at these and they have to ask themselves what is going to happen to nuclear technology? What is going to happen to thermo technology? What is going to happen to their continuing relationships with the government of the Province of Manitoba if we are looking at the Nelson River development?

Now, different people can come to different conclusions about the assumptions they should make, about the possible changes that could occur over a period of 35 or 40 years, which is the period of amortisation for the capital intensive project.

In the event, as you know, Ontario Hydro opted for the capital intensive nuclear station approach to it. You, senator, or others, may wish to say in that context that it was not a wise decision because they were not taking into account major changes which may well take place in the field of nuclear technology and they may well come up with some antiquated nuclear stations long before they are amortised but at least the cost benefit approach permits you to lay out on paper what you know are facts and what you know are assumptions, and you can then make some judgments about the assumptions themselves and then come to a conclusion.

Even the best cost benefit analysis is no substitute for judgment and some elements that go into the equation will inevitably involve judgment.

Now, you came to a different judgment than the people who wrote this example; I must confess I did not write that example. I read it and when I read it I had some of the same questions that you have. That is all it is, it is an illustrative example.

We have here with us right at the table a very high grade professional in this whole matter; perhaps you would like to put a question or two to Mr. Bruce MacDonald?

Mr. Bruce MacDonald, Director of Planning and Analysis Division, the Treasury Board: Senator, we have a chapter in here explain-

ing the theory of cost benefit analysis and the intent of this illustration was to clarify some of the terminology, rather than to force decisions as to whether or not to build hydro dams.

The Chairman: A kind of high school exercise.

Mr. Reisman: That is all it was, yes.

Senator Carter: I do not think I will pursue it any further.

The Chairman: It seems to me that Treasury Board in looking at the proposals put by agencies and departments is looking not exclusively but almost exclusively to new programs.

As a matter of fact, this assertion was contained in one of Mr. Drury's latest speeches; I read his speeches more and more. He was saying that Treasury Board was looking at new programs. I am sorry I do not have the quotation here, but this is what he said; would you care to comment about this?

Do you look exclusively or mainly at new programs?

Mr. Reisman: Mr. President, I have not got the quotation so it is awfully difficult to comment on it.

Perhaps I would say this...

The Chairman: Comment on what you do.

Mr. Reisman: If the Honourable C. M. Drury made an observation, I am sure it was a correct one and I would not wish to contradict it in any way, but what I would comment on, if you will direct the question to me in terms of what we look at, I can tell you that we look at the old programs, look at the ongoing programs, look at the new programs, look at everything which forms the subject of governmental expenditures, everything, and in looking at them we look at them in terms of how to fit them into a total national budgetary picture. In this we are guided, of course, by the wishes of the government and the priorities which the government establishes, but we look at everything.

Now, perhaps I ought to wait for your next question before commenting any further. I think I see the direction in which you are leading, but I think it should be put in the form of another question.

The Chairman: I am sure that you cannot look at everything with the same kind of attention. I remember being at various hear-

ings in the preparation of estimates when I was in the Department of Northern Affairs, and even in the office of the Privy Council. At that time at least there was the exercise of what we used to call "going to confession" before Treasury Board. If Treasury Board was looking especially at new programs, assuming more or less that the money given to the department the previous year was all right, they were looking at the addition, at least they were putting a special emphasis on that kind of examination.

I am sure that you attach a much higher priority to looking at new programs than looking at programs that have already been approved in the past by Treasury Board which were at some stage new programs.

Mr. Reisman: Yes. I suppose, sir, that that observation of yours has a certain general validity in it. If I were to bring in a motion and time study expert to examine what I do in the course of a day and he were to follow me around with a stop watch and determine how the senior staff of the Treasury Board spend their time, I think you would probably find that proposals for new expenditures occupy a considerable portion of the day-to-day work of the staff of the Board.

But then the staff of the Board, of course, is not made up only of people in the senior management brackets; it is made up of a staff that has some depth to it and in addition to looking at the problems that come to them from day to day they also have a very considerable on-going operation. That on-going operation is very much concerned with the on-going activities of government.

Now, I think to spell that out a little, let us take a relatively new program of the government, let us take the program of the government in relation to manpower training, occupational training of adults. This is a program which was put into effect three years ago, or thereabouts. There was very careful examination made of it and the government decided it would proceed in that direction and devote considerable resources to it. It is quite obvious that when you launch a new program you try to make sure that your whole management apparatus is properly equipped to do it well, but once you have got it launched it is going to take a little time before you know how it is working.

We, as part of good management control, are encouraging departments of government to have within their establishments built-in

capability of applying continuing review and analysis and evaluation of a program of that kind. We let them go to it and after a few years we will come back to them and say well, gentlemen, how is that program going? You set certain objectives for yourself; you applied certain resources; are you accomplishing your objectives? Are you using your resources effectively? Are you getting the results you anticipated? This is part of an on-going operation.

Now let us take a different sort of program; let us take a program that was introduced 20 or 25 years ago. I will take a specific example: I believe that at some time during the war a program was introduced and implemented by the Department of Agriculture to encourage the breeding and the production of a high grade hog that produced a good lean bacon ideally suited for the British market. Now, that program went on for many years and over the years it had good results. After a while perhaps its utility and its effectiveness in that direction became less marked. It would be a function of the Treasury Board to encourage the departments to review programs of that kind and if they do not do so on their own, to help them in that review process.

I can recall some years ago when this was looked at and some encouragement given to the Department of Agriculture to weigh that particular program against other things and to see whether they wanted to continue with it in that form, or perhaps in a modified form. Only recently, when the financial situation was such that one had to look very carefully at some of the ongoing programs, with our encouragement did the Department of Agriculture decide that perhaps it was time to abandon it.

There I have given you two examples, one of a very old program, one of a relatively recent program and I can give you examples of new activities where our attention will vary depending on a number of considerations and also on the organizational capability, both within the department and the Treasury Board, to give attention to that kind of problem.

I will make a confession here; I myself do not believe that the capabilities built into departments and built into the Treasury Board in past years have been adequate to the task of adequately reviewing all the on-going activities. I think we are making some

gains in this direction. There is a great tendency, and this is true in the private sector as in the public sector, for on-going things to continue on even long after they are no longer very useful. It is vital in circumstances where you never have enough resources to do everything you want to do that you have a good, effective on-going operation that vets and examines and evaluates the things you are doing, to see whether savings can be obtained or programs should be abandoned or modified, or replaced by new ones.

I am sure that Mr. Drury would agree with all of this, because I know I have discussed this with him on many occasions. He is rather devoted to this idea of a good effective management system of this kind: I know he prods me a good deal to see what we can do to develop our capabilities in this connection.

The Chairman: I think Mr. Reisman wanted me to explain to him what I had in the back of my mind: I think if you put too much emphasis, or almost exclusive emphasis on new programs then by the same token I think that you create a great inducement. I am speaking now especially of research agencies and research programs which are less perhaps wide than those you were envisaging when you were referring to the manpower training programs, et cetera. You create an inducement in those agencies to continue these older programs almost indefinitely, or to change internal composition as they go along without changing the name of the program, so that they can get the same amount of money year after year for these programs without going to Treasury Board and asking for more money for a new program which might be much more important than those they are carrying on.

Mr. Reisman: I take it, sir, the import of your question is that if we apply tougher rules or tougher scrutiny to new proposals than we do to old ones, there would be a built-in danger that less essential and less desirable things would be carried on and good things, deserving of higher priority, would not be permitted; this is your question?

The Chairman: Yes; or that at least less important things would go on almost indefinitely.

Mr. Reisman: There is certainly a danger of this; I can tell you that, in our relationships with departments and agencies, in speaking

to them, in writing to them, in giving them our views as to how to proceed with program evaluation, and in the preparation of their estimates and the preparation of their program proposals, we now have this five year forecast and we try to the best of our ability to encourage them to review carefully all the things that are going on and to think increasingly in terms of scales of priorities.

There is a tendency on the part of people to want to do all the things they have always done and in addition to do new things. What we like to encourage them to do is to have in their minds and committed to paper if they can, because we are pressing them to do this, an ordering of the things they can do according to their judgments as to their relative importance.

Now I am going to let you in on something: Questions were raised a little earlier about the telescope. In connection with the telescope, and I think I did indicate to you earlier that this was a subject that was considered at various levels in government, it was certainly considered by the staff of the Treasury Board on a number of occasions, indeed if my memory is correct this was a project that we first heard about, I think, in 1960. If I am not mistaken, the first proposals in connection with that major telescope were presented in some proposals that came in either in 1959 or 1960, and I think that the decision to proceed was taken in 1964. Then the decision to cease that project was taken in 1968.

Senator Lang: It was late 1967.

Mr. Reisman: Late 1967. In connection with that project at one stage in the evaluation that was taking place on the part of our staff, and evaluations were taking place elsewhere also, I put a fairly direct question to that department. I asked them where in the scale of priorities they put that project in relation to the whole range of scientific activities and other programs in which they were engaged and, as you know, they have a very substantial budget devoted to scientific and research matters, in oceanography, in geology, and in water research. There was a certain reluctance to reply to that question, but I pressed it and the answer I got was that it was low man on the totem pole; the answer I got is that they wanted to do it and they thought it was desirable to do but all the other things they were doing they thought were more important.

Now, that kind of attitude and that kind of response, which I can assure you departments do not arrive at easily, is central to our thinking. If your implication, and I do not think there was that implication, is that perhaps in abandoning the telescope something of high priority was being put aside because we were not scrutinizing adequately ongoing activities, then I would like to assure you that those questions were put directly. Foreseeably we got answers to them: those answers figured in the advice that we put up and, as I say, other advice was put up too, and the government eventually took its decision.

I would not want to pretend, I do not think it would be right of me to pretend that our system for evaluation and for priority determinations is perfect by any means. I think there are many weaknesses in it, many weaknesses indeed, and I am quite sure that there are many things that are going on in government that are of lower priority than things that people would like to do but for which they do not have resources.

It is important that we develop in the departments and in the central agencies an improved ability to cope with that kind of problem. I think that we are doing that progressively: we will never be perfect, but I think we are going to get better at it as we go along.

Senator Robichaud: The question I had in mind was covered by the last part of your question and by the reply given by Mr. Reisman, but perhaps I could ask another question which has to do with programs on a lesser scale than the ones that have been mentioned. Could we be told who decides, or how a decision is reached regarding the economic value of a certain program?

I will give an example of a small program: Subsidies were given for the construction of fishing vessels; as an example, a subsidy of \$100,000 on \$300,000 wooden vessel would provide jobs for six to seven men. The life of one of those vessels is 20 years, so during its lifetime it would provide work ashore for 30 to 40 people. All at once we find out that the government, or the department concerned, decides to practically do away with this program. As we look at this year's estimates, for example, there is just enough money to cover expenditures for the carry-over from the present fiscal year. There is a program that has been effective in helping the economy in a specific area of assistance to an industry. At

the same time, take the ADA program. Under ADA, companies are in a position to get grants for the construction of processing plants, but there is practically no control. All they have to do to qualify is to build a plant that will qualify under minor requirements. I mean, four or five plants could be built in the same area without trying to find out if there is a potential for those plants, and whether it is economically sound to proceed with such construction.

Who takes a decision? Is it the departments involved or Treasury Board?

Mr. Reisman: Let us deal first with the shipbuilding subsidy; there are a variety of shipbuilding subsidies that form part of the on-going policy of government and I am not sure which one you are referring to?

Senator Robichaud: I am referring to the wooden ship subsidy.

Mr. Reisman: There is a wooden ship subsidy; there is a trawler subsidy; then, of course, there is the commercial ship subsidy.

In connection with programs of that kind, once the government has decided that it wishes to have a program and its terms and conditions are defined, then the Treasury Board does not have all that much to do with it. The Treasury Board will have a great deal to do with it at the time it is being advanced and formulated and developed, and once the decision is taken to have such a program, then the responsible department carries that program forward.

Senator Robichaud: In this case in 1946.

Mr. Reisman: And this was a 1946 operation. We will, as I indicated earlier, from time to time have a look at the program and see whether it is in need of change or whether it should be abandoned. As you know, important changes have been introduced in the various shipbuilding subsidy programs.

In respect to the subsidy for commercial vessels, as a result of a very careful review by government, I think it was done on the staff side by an interdepartmental committee with the former Secretary of the Treasury Board as the Chairman, they spent I think something like five or six months reviewing that program. They decided that the subsidy should be changed, I think it was from 40 per cent to 25 per cent, a particular capital cost allowance feature should be eliminated, that the subsidy should be reduced progressively

from 25 per cent to 17 per cent and that when it reached that point it should be converted into a tariff. Now, this was a recommendation; the government accepted it and this is now in process of happening.

In connection with the trawler subsidy, I think that only a few years ago the subsidy carried a weight of 50 per cent. Again as a result of a review, and on that occasion the review was conducted in the Department of Industry at the request of the Treasury Board, the subsidy was reduced from 50 per cent to 35 per cent. This was done on the basis of an examination of the competitive position of the Canadian trawler industry as compared to competition elsewhere in the world.

I think it was at that time that they also had a look at the subsidy on wooden fishing vessels and came to the conclusion in consultation with the Department of Fisheries, in consultation with the private sector, that the health of the Canadian fishing industry and the health of the shipbuilding industry related to the fisheries would be advanced more by emphasis on the steel vessels than on the wooden vessels, which they felt were becoming antiquated. This is how the thing was evolved.

Now, whether the decisions were right or whether they were wrong, I can tell you that they were the subject of a great deal of analysis and eventually became the subject of a government decision.

Senator Robichaud: This is the kind of decision, you see, that can really be questioned. This is no place to do it, but I could really question it for hours and show where mistakes are being made. Such decisions could have the effect of destroying completely an in-shore fishery or a fishery that takes place even within the area of the Gulf of St. Lawrence. Certainly plants companies which have received grants from the government to operate fish processing plants may have to close their doors due to lack of production because the type of vessel required to bring them the fish they need in order to operate will not be available.

Mr. Reisman: Senator Robichaud, perhaps I should not make this observation, but if my memory is correct at the time that these things were under consideration I think you were the Minister of Fisheries. I know that your department was very directly involved in the studies and in the review, and I sus-

pect, although I am not sure, that you were a member of the government that took the decision on these matters.

Senator Robichaud: I would like to question this because the facts are that this was one of the programs that was out of control. It is true there was no control on the amount of subsidy. All the provinces had to do was to go ahead and build boats, but in November 1967 a meeting was held with the provinces concerned, and a system of control was established. Then, twelve months later we find that the program is discontinued. To me this is not acceptable to the industry.

What I was trying to find out was who was responsible? Would it be a Treasury Board decision or one of the government departments involved?

Mr. Reisman: I think the answer, sir, is that that was a government decision.

The Chairman: There is no such thing, apparently, as a Treasury Board decision.

Senator Carter: We hear about them a lot though.

The Chairman: Oh, yes, but they do not exist.

Senator Robichaud: What I wanted to come to is the economic value of certain programs. There was a program which really was providing jobs in an area where they are needed, and then all at once the program is discontinued. The effect in years to come could be serious.

Mr. Reisman: If I am not mistaken, sir, although this is subject to checking, I believe that the program remains in force. I also believe that the department, and when I talk about the department, of course, I mean the minister, that this decision was taken by that department in terms of their sense of priorities in their scale of things. They preferred to put more resources into something else rather than into that particular program, but the program as far as I know is still on the books; it is an on-going program.

If you feel very strongly about this, sir, I would suggest that you make representations to the Minister of Fisheries on the subject.

Senator Robichaud: They have been made already.

Mr. Reisman: Your second point, sir, was on ADA, the area development program which, as you know, is being reviewed very

carefully and there will be a new and modified regional development program under the new department which will come into being at the end of March under the Honourable Jean Marchand. This is a program that I did have a lot to do with in a period of quite a few years and I think you will find that the terms and conditions under which incentives are given in the area development program are established by statute. There was the Area Development Incentive Act and there was a Department of Industry Act. Both statutes are on the books. The Department of Industry Act establishing the Area Development Agency will I think disappear when the new department legislation comes in but, as it exists today and as it existed during the period that I managed it, the terms and conditions were established by statute and processing and manufacturing enterprises that qualified under the terms of that legislation were entitled to subvention in accordance with a fixed schedule.

You asked whether there was any detailed scrutiny in examining the applications; there was scrutiny, but only in terms of whether the application conformed to the terms of the legislation and whether other conditions, such as the equity provided by the entrepreneur, whether the equipment to be put in was new, and all these conditions. These were examined; if they met the terms and conditions the subsidy was granted.

That may sound pretty haphazard but indeed this depends on your philosophy of economic organization and economic enterprise. I think it was an assumption of the government that private enterprise could be relied on to make investments which in their judgment would be valid. It turned out I think in some industries that a number of enterprises made optimistic assumptions about what the market would be and some of them got into difficulties, not too many. Some of them did but, of course, this is of the order of things in our private enterprise system. Judgments are made, investments are made and the Act had that basic assumption that when in a private enterprise economy the entrepreneur decides to make the investment, he would have examined the market situation and made his investment in the expectation of a profit. Sometimes the expectations are not fully realized.

The Chairman: I would like to come back to your brief: On page 3 you describe the program branch, which is of more direct

interest to us, although it is not an exclusive interest. You show there that there are five main divisions in that program branch and in terms of research finance, external aid and trade and commerce are in division I. I understand because of the explanations that you have further on Defence Research Board is in division No. II, social sciences, including economic research is mainly in division IV, while economic measures are considered in division III and research in transportation, housing and communications are in division V.

Now, the whole branch has people working in it.

Mr. Reisman: Fifty-five officers.

The Chairman: Fifty-five officers, yes, of course. I assume that they are not like senators; they have secretaries.

Mr. Reisman: They do not all have them; we are probably as economical in that respect as anybody.

The Chairman: Well, let us say 55 professional people.

Mr. Reisman: Yes, sir.

The Chairman: Would they be assigned to specific divisions?

Mr. Reisman: These officers? Oh, yes indeed.

The Chairman: So how many would you have attached to these various divisions?

Mr. Reisman: It would vary between five and nine officers per division, depending on the weight of work. There is a certain flexibility, I might say. If we get a heavy input in a particular area and a lighter input elsewhere we will shift people around, but these people are allocated to their divisions and within the divisions the sections. In the ordinary course of events they become pretty expert in the particular field to which they are required to address themselves.

The Chairman: So that these five or seven people, for instance, have to examine all the programs within their division, including of course the research component of these individual programs. In finance, for instance, to take division I, what they are doing in finance in terms of research, what external aid is doing or planning to do, what industry, trade and commerce is planning to do. Do you

not think that even if they are experts it is not many people to look at all of the policy questions and the programs involving policies and also the research aspect of it, especially when you come to DRB and big organizations like NRC?

Mr. Reisman: There are a number of points you are raising, sir: First you point out that we do not have a large number of people and we have a great deal of work to do. I certainly will not argue with that; I think that is very, very true. We are a pretty lean organization and we work our people very, very hard.

You are raising the question whether with numbers of the kind indicated and responsibilities of the range indicated they can do a competent job. It really turns on what their job is. We like to think that the job of management and the job of evolution and the job of formulation belongs to a department or an agency. They have the numbers of people, they have the expertise, this is what they are paid for and we like to think that they should be entitled to manage these situations which they have been appointed or hired to manage.

I think the term that Bob Bryce used in his evidence before this committee in describing the role of the Department of Finance is that they regard themselves a bit like the official Opposition in Parliament in dealing with departments and agencies in the field for which they have responsibility. In a very real sense that is the way we operate also.

The ability to ask intelligent, probing questions at a critical time and to pursue them is a very large part of our job. We ourselves do not have to be scientists to ask intelligent questions about a science program.

The Chairman: We cannot argue against that.

Mr. Reisman: Although we have some scientists as well.

The Chairman: How many would you have?

Mr. Reisman: I suppose that on our staff we have quite a few people who are trained in engineering and who are trained in the physical sciences and who are trained in the social sciences.

For example, Dr. Wagner who is here with us today is in Mr. Fry's Program Division. Incidentally, that is the program division that has most of the scientific programs.

The Chairman: That is the third division.

Mr. Fry: The major scientific programs are concentrated there and we do a co-ordinating job with the other divisions who have scientific programs. Dr. Wagner is involved in that, so there is an overall look taken at science.

Mr. Reisman: Dr. Wagner was a Professor of Physics at McGill University; he was a Director of Research at RCA Canada; he ran a corporation producing high technology products called Syntex; he was the President of that organization and we are now fortunate in having him on our staff. From time to time we have to call upon him to make some important and highly professional technical and scientific inputs.

Strangely enough in our Personnel Policy Branch running one of the divisions, I think it is Manpower Division, we have a man who is a Ph.D. in entomology and who did a great deal of highly qualified scientific work.

I think if I ran through my various branches you would find quite a few engineers and scientists and quite a few economists as well.

The Chairman: But this man who specializes in entomology would probably have some control over entomologists, but not over their programs, because he is in the personnel field.

Mr. Reisman: Let me give you an example of the way we work and how flexible we have to be: When the government decided that they wanted to engage in an improvement of the government apparatus through a major reorganization a large part of the burden fell on the Treasury Board. Ten or eleven task forces were set up to deal with one or other aspect of this reorganization. One of the task forces dealt with the amalgamation of the Department of Forestry and the Department of Fisheries and also with the Fisheries Research Board. We needed a Chairman for that task force and we leaned into our Personnel Policy Branch and picked this man because he had a great expertise in the field, had worked with, I think, the forestry branch and we used him in that capacity. As you know, the Department of Fisheries, the Fisheries Research Board and the Department of Forestry have a very hefty science program and the whole question of how they might be organized in order to get the most out of that apparatus fell heavily on the Chairman of

that task force. We happened to be fortunate and we were able to use that man in that capacity.

So we try to make use of our people that way, but I would not pretend that we have a wide or a large number of scientists who can range over the whole field, but we do have quite a lot of intelligent people who can ask the right questions.

The Chairman: I do not deny that, but to come back to this third division there, you will have about five to seven people there?

Mr. Reisman: There are nine.

The Chairman: And of course they have to look at all the economic measures of the government. This is a pretty wide field, so that even if they are very competent and they are hard workers, and I do not deny this at all, I suppose that there is very little time to have a serious look at all the individual research programs within these fields.

So when they feel that they cannot appraise a program, where do they go?

Mr. Reisman: I suppose a large part of our work is to know where to go; we have become very expert in getting people to do the work that we need to have done. As I say, this really is the art of asking the right questions. I suppose if you talked to departments they would complain to you that we ask too many questions and that we require them to turn in too much material, but if we want to investigate a particular situation, a particular area, the Treasury Board has within its powers the right to ask questions and to get answers.

What we need really is not an ability to provide the answers, but a good critical ability to scrutinize them, to understand them.

Now, with the creation of the Science Secretariat we have an additional capability in government which is also available to the Treasury Board.

The Chairman: They have eight people there.

Mr. Reisman: We can cite some examples where if one needed advice at the Treasury Board level on a particular project or program for which we ourselves did not have enough expertise to make a judgment on it ourselves, we turn to the Science Secretariat and within the limits of their staff they have been very co-operative and on a number of

occasions have been able to provide very good help.

The Chairman: We have been told stories, and I am sure that these are completely untrue stories, that on certain specific programs Treasury Board would turn to the Science Secretariat; Science Secretariat would not have, unfortunately, the proper expert knowledge and would go back to the original agency, which had been the first proposer, for advice to give you.

Mr. Reisman: I think those are apocryphal stories that probably have lots of humour in them but not too much truth.

The Chairman: Of course you would not know this; nobody would tell you this.

Mr. Reisman: You would be amazed about how much we know; you really would be quite amazed. When the comment was made that the Science Secretariat is made up of a half a dozen or so people, I think we must not overlook the fact that the Science Secretariat themselves have on many occasions turned to help outside the government in particular areas. They have set up task forces; they have conducted particular investigations; they have hired people on contract; they have set up teams made up partly of their own people and people from the outside, people from other departments, but if the suggestion is that they are sort of a closed circle, that the people who are proposing are also the people who advise on the critical evaluation, it could happen, but if it happened it would be highly exceptional and it would be because somebody in the Treasury Board had been asleep and I am telling you we do not get that much sleep.

Senator Lang: I want to ask a question as to whether it would be feasible to implement a scheme whereby in some or all programs of government after initiation a time was set upon it which the controller of that program had to show cause, say before the Treasury Board, why his appropriation should be renewed?

In other words, is there any way to build into the system something that puts the onus on those carrying the scheme to show cause within a certain time why they should continue?

I do not know whether this is a feasible idea or not, but it puts the onus on those who are carrying forward the thing and also I

think it might create a certain attitude of mind at the inception of the scheme that could be beneficial.

Mr. Reisman: It is a very interesting idea. Some of the programs of government which derive from specific legislation are often cast in terms of specific periods of time when they have to be renewed. If that is the wish of the government, to renew them, then they need fresh legislation at that time, so that you have that kind of control in some instances.

In other instances, of course, the operating departments have to come back for appropriations each year. Now, in coming back for appropriations they are required to submit a case; they are required when they ask for money either for something on-going or for an expansion of a program, or for a new program to tell you what they want the money for. Increasingly they are required to tell you what their objectives are; they are required to tell you that in some kind of time frame too.

This provides an opportunity at the time when we do a program review and at the time when we are preparing the estimates to get at them. This, of course, puts an onus on them to submit justification, but it puts the onus on the central agency to apply a critical scrutiny.

Let me give you an example; I mentioned the manpower program earlier. It was a relatively new program; we felt that the time had come a year ago to do a critical scrutiny. We wanted to know now what they had got, what they had accomplished? They told us that it was a little early for them to come up with any definitive expose or findings on that. We told them that the next time they came up for money they had better have such an evaluation or they would find it very difficult to get their money.

We will be beginning to look at this next year and we are expecting that we will get such a critical evaluation; if not, they will have a tough time getting money.

This is the kind of annual process there is now. Your Chairman, Senator Lamontagne, indicated that there are a lot of programs and there are not many program officers, and are we always on the bit? We try.

The Chairman: I am sure.

Mr. Reisman: And at times we are quite successful. This is an exciting idea; it would be very helpful to us, really, if some such

system were introduced. We are widespread; perhaps this is the sort of thing you might want to make some recommendations about, Senator; it would please us.

Senator Lang: My thought was at time span greater than a year; I think the year is a pretty heavy onus, coming back every year to justify it tends to become automatic over a certain number of years, or it tends to remove the burden from the proponent. I was thinking of a time span considerably longer perhaps. It would not have to be arbitrary; perhaps it would be different in the case of these programs, beyond a yearly estimate, a five year scheme, or three years, ten years, or whatever it may be, where the problem of retaining that appropriation then became critical and not as routine as the requirements of an annual estimate.

Mr. Reisman: Just as a quick, off-the-cuff reaction, sir: From the Treasury Board point of view I could see a great deal of merit in a system of that kind. I hope you will persuade your colleagues on this committee that this is a proposal that is worth their very careful consideration.

Senator Robichaud: I want to make a brief remark in relation to the question which I asked a while ago regarding the fishing vessel subsidy: I was prompted to ask this question following the one asked by Senator Carter on the illustration of cost benefit analyses which is described in Appendix D of the brief.

My suggestion would be that someone on the staff of Treasury Board would take the same illustration of cost benefit analysis and apply it to the subsidy on the construction of wooden vessels and see what results they will get.

Mr. Reisman: I am not sure whether we have done such a study.

Mr. Fry: No, we have not done a study ourselves on that particular program, but we are more and more engaging departments to use this sort of study. We are also in our own shop working up examples which we are going to departments with and saying here is how you can do this kind of thing, let us get started on it.

We are meeting with a great deal of acceptance of the idea, but that particular program, it may have been the subject of cost benefit in the department, but we did not see it.

Senator Robichaud: I would hope that it would be done, because there will certainly be some surprising results.

The Chairman: In terms of personnel for government establishments, do you look at this situation fairly closely, not only in terms of possible savings but in terms of also providing the personnel? We have had complaints throughout our inquiry here that various agencies had such an establishment, a given establishment, but they could not find the people to hire and their research activities were being limited by this.

In particular we have been told by the Chairman of the Public Service Commission that some time ago, perhaps three weeks ago, he received requisitions from various departments for 400 additional economists and he was certainly under the impression that he could not find them.

Mr. Reisman: We ourselves with Treasury Board are not the recruiting agency for the government; this is done by the Public Service Commission. We are concerned with establishment; we are concerned with pay and conditions of work; we are concerned with training. In all these fields in the personnel function we, of course, have to be keenly aware of what is taking place in the market.

If we have provided establishment for particular classes of let us say scientists or economists and the classifications and the pay are such that they cannot hire them, then obviously we are not doing our job very well. So we do try to keep very close touch with the market in connection with our classification work and also in connection with the pay and conditions which, as you know, is largely the subject of collective bargaining today.

So either through collective bargaining or through the decisions of the employer we try to keep the pay levels competitive with the private sector who employ similar people but, as you know, there are shortages in certain fields which cannot be overcome in the short term, no matter what we do in respect to classification and pay; all it would mean is that you would rob Peter to pay Paul.

The Chairman: That means that a few years ago we were wrong perhaps in our assessment of the situation. We were told, for instance, that in certain fields through government financial encouragement in universities in terms of scholarships and all this we were about to produce a surplus in certain fields of

Ph.Ds, and here we have this great scarcity in the field of economics and the social sciences generally. My own conclusion is that there is an imbalance there, that nobody looked at that kind of imbalance a few years ago.

Mr. Reisman: Where does responsibility reside in a country like our own for decision in respect of training, education, graduate schools, and that kind of thing?

The Chairman: I am speaking only now of financial inducements which are given very generously by the federal government in various fields.

Mr. Reisman: I suppose the major inducement provided by the federal government in the field of these high skills is through the program whereby the federal government pays half the total cost for the country as a whole in operating post-secondary institutions; that takes in all the universities, all the graduate schools.

The Chairman: Of course this is the most important part of it, but in addition we have—

Mr. Reisman: In addition the National Research Council gives grants; the Canada Council gives grants; there are other devices also. For example, right within the public service there are a variety of facilities whereby people can upgrade their skills, or go back for training in certain fields where there are great shortages. For example, in connection with translation a facility has been provided where people can be taken on, put on pay, and then sent out to training immediately; there are a variety of measures of that kind.

In our Manpower Division we try, both through training within the government apparatus and through training assistance, to encourage people to go out to the universities and upgrade their skills; we try to do that in a manner which best fits the needs. In other words, if it comes to our attention that there are surpluses in some areas we obviously are not going to be as generous in the kind of assistance we provide there as in some of these social sciences.

The Chairman: But you never had any systematic overall view of this whole manpower situation in relation to what government needs?

Mr. Reisman: Let me put it this way. The personnel function in the Treasury Board is

perhaps the most rapidly growing function we have. I suppose something like half our total staff today are in the Personnel Policy Branch. That takes in collective bargaining; it takes in pay and conditions; it takes in manpower development; it takes in that whole range of things.

We are at present trying to do that kind of job which was not done at all five years ago. Today we have that function. Obviously there are deficiencies. But there must have been inadequacies for some time. It is awfully difficult in a country where you have so much diversity and where the decision-making process is so diverse between all the private and public institutions, the universities and the institutions, to get just the right fit.

My own feeling is that we have got to do a lot more in this field, a lot more.

The Chairman: Especially if in addition to having the science component of all our programs we do not have an overall science budget, because then we cannot see the imbalances.

Mr. Reisman: Mr. Chairman, I think you know my prejudices in this field. I myself think that the notion of an overall budget for science is nonsense; it is a view I have developed over a long period of time, having worked closely with it and my reason for it is it really turns on what is science? I have here a piece of paper which was prepared for me and describes how the OECD, the Organization for Economic Co-operation and Development in Europe, with Canada as a member, defines science. There are pages and pages of disciplines that are embraced in their definition. They have six categories; they have natural science, which takes in mathematics, physics, chemistry, physical chemistry, biology, botany, zoology, biochemistry, biophysics, geology, and so on. Then they have got a whole series of categories under engineering science, metallurgy, mechanical, construction, electrical, aeronautical, and so on. Then medical sciences, agriculture and social sciences, and so on.

If one looks at the activities under all these fields, they are so diverse and so widespread and penetrate every field of human endeavour that to talk about a single budget embracing all these diverse activities is an abstraction of the kind that my mind is incapable of grasping in terms of developing an effective tool for financial control or of management.

This is really my difficulty; it is not a religion with me, it is just that it is not a helpful concept in terms of doing the kind of work we have to do in connection either with training, development, budgetary control or choice of priorities or whatever our real job is; that concept does not seem to give me much help.

The Chairman: I think you have forgotten your old Keynesian days.

Senator Lang: Perhaps it is a good thing, too.

The Chairman: It seems to me that there is, of course, a necessity to look at sectors of research connected with their policy mission; that is for sure.

Mr. Reisman: Yes.

The Chairman: And you certainly agree with that?

Mr. Reisman: Yes, sir.

The Chairman: Of course, even here I would say that in our federal system we have at the federal level several research programs which are not directly related to a federal mission because the mission does not exist. It belongs somewhere else, like in forestry, for instance, but on top of that is it not true that whatever we feel there is competition for manpower among various fields between the different sciences? There is competition for funds; there is also a growing interdependence between various fields. So that, for instance, research in forestry may help research in agriculture, or research in the physical sciences may have a growing impact on the result of research, or as a contribution to the live sciences.

So that at some stage I am tempted to make an analogy between what we call microeconomics and what we call macroeconomics. Of course, your microeconomic approach does not give you the whole story, but the other one does not tell you the whole story either; the two have to complement each other. Otherwise there are a lot of fools in this world now looking at science or science of science or science square—a lot of people losing their time.

Mr. Reisman: I suppose, sir, there are a lot of people losing their time.

The Chairman: Not in Treasury Board.

Mr. Reisman: I think I understand what you are talking about when you talk about the micro approach and the macro, but in the

macro approach it is a question of what you put into the basket. If you talk of macro-economics you are examining how all aspects of your economic system fit together, relate to one another. There are certain instruments and certain tools for influencing the economy which must look at all the economic programs and activities of the country; at least you are dealing with a packet of things which have some commonality, which have a discrete and distinct relation.

The Chairman: The aggregates can contain a lot of different things, too.

Mr. Reisman: Let me put it this way: If you are talking about a program to induce the upgrading of technology in Canadian industry, which is a very important area of government activity relative to scientific and technological development of the country and you have that category of things in the technological development of Canadian industry, which has many, many facets, some of it is done through incentives through the taxation system, some of it is done by grants, some of it is done by contracting out by operating agencies of government. There is no question that all these are related one to the other; indeed, there is a study going forward right this moment, initiated by the Treasury Board, to examine all aspects of governmental activities which relate to the stimulus of industrial research and technology. Here is a family of related problems.

The Chairman: This is also related to intramural programs.

Mr. Reisman: It is indeed; indeed, one of the programs which I initiated in the Department of Industry when I was there was to try to relate more closely the scientific activities which take place in the universities to the needs of the surrounding industrial community. We provided what we called establishment grants to set up research development institutions, industrial research institutes we called them, in universities. We gave them an initial contribution to get established on a basis whereby they would be supported in the long term by the industrial community around them. This was a deliberate effort to develop a relationship between what is being done intramurally in the universities and the needs of the industrial community.

We used our funds very sparingly, but I think effectively, and by the time I left the department we had five such institutions going.

The Chairman: You are beginning now to develop a very important aspect of the overall view.

Mr. Reisman: Now, if you are taking a macroscopic view in the field of industrial research and technology, I agree with you entirely, but if you want to relate industrial technology, sir, to the life study of the butterfly or the sex life of the giant crab, or some other matter, then I really think that this gets you into trouble.

The Chairman: You are just teasing me; I do not think that we should pursue this seminar for too long. We will have occasions to come back to this.

Mr. Reisman: Mr. Chairman, I wonder if I can make one comment?

The Chairman: Yes.

Mr. Reisman: The notion that you developed in your theme about a single science budget; I used rather strong language in describing it on a personal basis. I think I used the adjective that to my mind that is nonsense. I think I would like to strike that from the record because it is a much too dramatic way to do it.

I know that many thoughtful and able people have seen merit in that kind of approach, at least from one point of view. I can see some merit in it too, from that point of view, namely as a means of focusing the attention of the public at large on the fact that the national resources devoted to an area of disciplines is not adequate. From that point of view, taking all of your figures together and adding them together and saying to your people, now look, do you think you are allocating your resources properly if you only devote X dollars to all the scientific activities taken together?

From that point of view I would acknowledge that it is useful to put all these things together and perhaps for certain other purposes.

In terms of management control, in terms of priority setting in the more discreet sense that we are engaged in it I have rather more difficulty with it, but to attach the word nonsense to it is an overstatement substantially and I would like with your permission to strike that from the record.

The Chairman: I would be the first to agree.

Senator Carter: Does the Treasury Board review the programs of the Scientific Research Board; say the Fisheries research Board, we are talking about fisheries research now? Do they come to Treasury Board to get their programs reviewed?

Mr. Reisman: Yes, they do, sir.

Senator Carter: They have to justify what they are doing?

Mr. Reisman: Absolutely, sir. Now, in that connection I might just observe that I believe that the government organization bill envisages that the Fisheries Research Board will become an integral part of the Department of Fisheries and Forestry, in the same way that the scientific activities of the Forestry Department were an integral part of the department.

The Chairman: I thought it would be the other way around.

Senator Robichaud: May I just remark that the Fisheries Research Board has a freedom to determine its priority; they determine what program they would like to see proceeded with first.

The Chairman: Yes, first, but then they have to submit it to the Treasury Board.

Senator Robichaud: But they select their own priority.

Mr. Reisman: Yes, indeed; this is true for every department and agency. We do not try to tell these people who are experts what they should be doing. We may ask questions about it, but it is their business and we try to maintain that. This is correct, sir.

Senator Carter: I was interested, you see, way back when you were talking about this telescope, that it had a lowest priority on the list, but that was for that department where it was competing with a lot of other projects which that particular department were more interested in. It does not follow that if you had somebody reviewing that on a national basis or in an overall context that it would still be low man on the totem pole.

Mr. Reisman: You are raising a most vital issue, senator; there is no question that this issue that Senator Carter now raises is perhaps the most difficult of all. If you look at individual agencies and departments it is at least manageable to talk about priorities. If you begin to look at a number of agencies and departments and begin to pull them

together your problem of priorities become even more difficult. Then if you put it on a total basis it is not in the less—

The Chairman: Perhaps it becomes more difficult, but it also becomes more realistic.

Mr. Reisman: I will comment on that sir. It is not only a matter of one science project with another science project; indeed it is one whole program against other whole programs.

For example, let us take a program like the ING, which was a vast program involving I suppose hundreds of millions of dollars; whatever figures were put in initial reports I think one can say fairly that this involved hundreds of millions of dollars. In that sense a program of that magnitude has got to be offset not only against scientific things but against virtually everything else that the government does. It has got to be offset against such a thing as the causeway to Prince Edward Island, or Medicare, or the whole regional development program, which is also in that range of magnitude.

These are the most difficult things of all and this is, of course, why man invented government; this is what it is about and the government through its whole elaborate structure has somehow to make these choices. Do they always make the wisest choices? Do they have the apparatus that permits them to even measure this one against the other? This is the greatest dilemma of all; all I can say on that is that we are trying to develop methods and mechanisms to make that job of government more manageable or, as the Chairman said, that is the only realistic way to go at it. In the end that is true and this is why you have a Prime Minister, this is why you have a Priorities and Planning Committee; almost all these choices in the end have to go up there.

When they looked at ING, surely in the minds of each of the ministers who were there and in the minds of the Cabinet to whom they reported, they must have been thinking in terms of that program in relation to the whole range of commitments that they had already made or were being pressed to make.

There is no logical way that I know of for making these choices, but we do try to do it.

The Chairman: It would be a nice note to end on, but I think I still have another question which is much more down to earth. You were speaking about the Treasury Board and

its meetings. How many meetings of Treasury Board are there a week usually in the normal period?

Mr. Reisman: In my short period with the Board, which is about a year now, we have had one meeting a week of the Board itself; we have had several occasions when we have had an urgent meeting of the Board and we now have another committee on collective bargaining, which is a subcommittee of the Board and they meet on request. They have met maybe a half a dozen times in the course of the last six months.

The regular Treasury Board meets once a week, on Thursday at 2.30 p.m., either in the Cabinet Chambers or next door here down the hall when Parliament is in session. Today we have a meeting at 2.30 p.m.

The Chairman: How many decisions would you reach in the course of one meeting, a typical meeting?

Mr. Reisman: It varies a good deal; I would say that during the period that I have been Secretary of the Board we would take somewhere between 20 and 30 decisions, of which perhaps two or three might be important and the others would not be terribly important.

The Chairman: Not more than that?

Mr. Reisman: Not more than that. We have rationalized that a great deal, sir. I believe you were on the Treasury Board in earlier years and Senator Robichaud certainly was. We have moved very dramatically in terms of the agendas of the Treasury Board in a very important way; we have delegated to depart-

ments and agencies decisions of how many typewriters they can have and this and that. What we try to keep on the ministers' agenda are things that really matter; I think you would commend that, would you not, sir?

The Chairman: Yes, is there an agenda circulated prior to the meetings to ministers?

Mr. Reisman: Yes, sir; what we do is we have a black book for each minister and the day before the meeting each minister on the Board who has indicated that he will be available to attend gets a copy of the book, which contains the agenda and descriptive material in relation to each item on the agenda. In addition to the ministers I am always present, together with the Assistant Secretaries of the Board, each of whom speak to their section of the agenda.

The Chairman: I am glad that there is an agenda now.

Senator Robichaud: There has been an agenda now for a couple of years.

The Chairman: Thank you very much again for spending this time, submitting yourself to all these questions and sharing your vast experience with us.

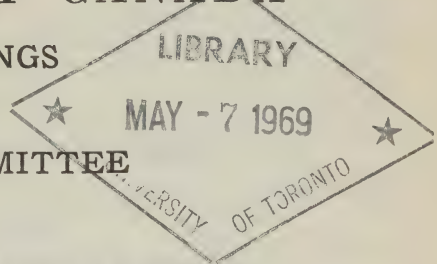
Mr. Reisman: Mr. Chairman, you and your colleagues have been most gracious in receiving me. I have been treated very, very well. I have enjoyed this experience, and I hope there will be occasions when you will give us a chance to come in and comment again. Thank you very much.

The committee adjourned.



First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA
PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON
SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 37

THURSDAY, MARCH 6th, 1969

WITNESSES:

POST OFFICE DEPARTMENT: C. F. Hobbs, Director General, Planning and Systems; H. D. W. Wethey, Director, Engineering Branch; and R. D. Myers, Acting Director, Postal Service Branch.

APPENDIX:

36.—Brief submitted by the Post Office Department.

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,
The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

THURSDAY, March 6th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Bourget, Carter, Kinnear, Robichaud and Yuzyk—7.

The following witnesses were heard:

POST OFFICE DEPARTMENT:

C. F. Hobbs, Director General, Planning and Systems;
H. D. W. Wethey, Director, Engineering Branch; and
R. D. Myers, Acting Director, Postal Service Branch.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 36:

—Brief submitted by the Post Office Department.

At 5:00 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

HOBBS, Clement F., B.Sc. (Maths), P.Eng., F.I.S., F.S.S., has been appointed by the Public Service Commission to the position of Director General, Planning and Systems. In making this announcement, Postmaster General Eric Kierans indicated that the appointment was effective January 27. In his new position, Mr. Hobbs will be responsible for four branches: Operational Research (econometric techniques applied to solving managerial problems); Information Systems (computer operation and programming, systems analysis); Systems Research (transportation systems and mail sortation systems for the future); Strategic Planning (long-range planning of the department). The first two of these branches are already in existence, but the latter two are in the planning stage. A native of London, England, Mr. Hobbs served in the British army from 1944 to 1948, after which he worked for the United Nations in Geneva for one year. He returned to England in 1949 to work as a statistical assistant for the Medical Research Council where he was involved in the Montebello atomic tests and served as the Council's back-up man for the Everest expedition. He joined the Guided Missile Division of the Fairey Aviation Co. in 1953, working in the advanced weapons design group, and in 1954, he received his B.Sc. (Maths) from the University of London. Mr. Hobbs arrived in Canada in 1955, joining the Department of National Defence Inspection Services at Nicolet, P.Q., where he was a Senior Ballistics Officer. In 1959, he transferred to Ottawa to work with Army Equipment Engineering as a systems analyst and, in 1963, was appointed as Head of Systems Analysis. During his tenure with the D.N.D. in Ottawa, Mr. Hobbs developed two statistical standards for quality control inspection, both of which are accepted in Canada, Great Britain, Australia and the U.S.A. Mr. Hobbs was named Superintendent, Systems Engineering, at the Canada Post Office in 1965, and was subsequently appointed Director, Statistical Programmes (now known as Operational Research) in 1966. In 1960, he qualified as a Professional Engineer in Industrial Engineering, and two years later was elected a Fellow of the Royal Statistical Society. In 1968, he qualified as a member of the Institute of Statisticians and was immediately elected a Fellow. Mr. Hobbs and his wife, Sonia, were married in 1960 and have two children—a girl, 4, and a boy, 2.

WETHEY, Harry D. W., B.Sc., P.Eng. Mr. Wethey is Director of Engineering of the Post Office Department, having been promoted to that position from Chief Engineer in May 1965. The Post Office Engineering Branch which he now heads, covers all aspects of postal mechanization for new or improved major post offices. This ranges from the industrial engineering study during planning, to production of plans and specifications, supervision during installation and organization of maintenance for the equipment in the completed plant. The Branch is also responsible for Research and Development and for the provision of a wide range of "standard" equipment from sorting cases to platform trucks. Mr. Wethey came to the Post Office in October 1957 when he was appointed Chief Engineer. During his time as Chief Engineer, both the Research and Development Division and the Systems Engineering Division were brought into being and their programmes of work were developed. At the same time, the Mechanical and Electrical Engineering Division was expanded in size and in the scope of its work. Mr. Wethey accompanied the Director in 1957 and again in 1961 to American-British-Canadian Post Office Technical Information Exchange Conferences in Washington, D.C. In addition, during his tenure as Chief

Engineer, he made three trips to Europe on postal mechanization matters. Born in Winnipeg, Man., he received his grade and high school education at Neepawa, later attending the University of Manitoba from which he graduated in Electrical Engineering (cum laude) in 1931. On graduation he was commissioned in the Royal Canadian Corps of Signals (Regular Army). Early in World War II he served in field units (Signals) and received a Signal Staff appointment in 1940 with the rank of Major. He served as Liaison Signal Officer with the United States Signal Corps in 1943 and 1944 at the Pentagon, Washington, being promoted to the rank of Lieutenant-Colonel on this appointment. From 1944 to the end of the War he was Officer Commanding the Canadian Wireless Unit on loan to Australia. At the close of the War he was appointed to command the Royal Canadian School of Signals at Kingston, Ontario. He spent a year in Switzerland in 1948 as Army Member of the Canadian Delegation to the Provisional Frequency Board, during that time being chairman of a working group. For five years he was Senior Lieutenant Colonel in the Directorate of Signals at Army Headquarters, dealing with various phases of radio communications. He has commanded the Northwest Territories and Yukon Radio System with Headquarters in Edmonton, consisting of a network of 22 radio stations. His hobbies include curling and reading. Married, he has a daughter.

MYERS, R. D., Recently appointed as Acting Director of Postal Service, Mr. Myers entered the service in 1954. He worked in the Montreal and Winnipeg Post Offices during the time the Methods and Standards Programme was introduced to these offices. He was educated in Winnipeg and was with Burns & Company for a number of years in several western cities doing Methods and Standards work. He was a 'Naval type' during the war. Married, he has a daughter and three sons.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, March 6, 1969.

The Special Committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, the head of the delegation representing the Post Office Department this afternoon is Mr. C. F. Hobbs, Director General of Planning and Systems. He is accompanied by Mr. H. D. W. Wethey, Director of the Engineering Branch, and Mr. R. D. Myers, Acting Director of the Postal Service Branch.

I understand that as usual Mr. Hobbs will make a brief opening statement; Mr. Hobbs?

Mr. C. F. Hobbs, Director General, Planning and Systems, Post Office Department: Mr. Chairman, honourable senators, in response to your request a brief was presented by the Post Office Department.

The activities of the Post Office of interest to your committee fall within the definition of applied research and development, data collection and scientific information since all our research has specific practical objectives.

The research and development division of the engineering branch are primarily concerned with electro/mechanical equipment used in mail processing and handling, but they provide a service in all areas where engineering skills are required, for example, the development of items of standard equipment in new and modern form and the evaluation of mail processing equipments obtainable from other countries.

The establishment of an operational research branch was authorized in 1966. This branch offers mathematical, statistical and economic skills to all branches of the department.

The main contribution to date has been in the areas of mathematical model building for

transportation and mail volume forecasting problems and in data collection and analysis for revenue and cost determination by class of mail.

Both of these groups are small, but I believe they have made a significant contribution to the solution of some of the department's problems and there is no doubt that their skills will be utilized to the full in the future.

If you have any questions Mr. H. Wethey, the Director of Engineering and Mr. R. Myers, the Acting Director of Postal Service or I, will try to answer them to your satisfaction.

The Chairman: That statement was certainly brief.

Senator Carter: He is a good engineer.

The Chairman: We have had longer opening statements before but this one was certainly to the point. Senator Kinnear?

Senator Kinnear: Thank you, Mr. Chairman. I have read the brief. Not being an engineer or a scientist I found some of it difficult but, like every person in Canada who is interested in the mail, I did find some questions to ask.

The mail service has not changed a great deal in the past hundred years to the layman. No doubt it has changed a great deal to the Post Office Department. I think probably everyone in the department has read what Postmaster General Lawrence O'Brien said of the USA, that if the US phone business were run like the post office, carrier pigeons would have a great future.

The Chairman: The government phone directory is almost like this.

Senator Kinnear: At the present one sees other indications of a coming revolution in postal services brought about by technological advances. For example, the New York *Times* of June 23, 1968, notes that Britain is

improving the handling of mail and, of course, from the experience of a great many people who travel in Britain they think that their mail service is a great improvement over the services in many other countries.

The British Post Office is introducing a system of mechanized mail handling that it says will be the most advanced in the world. The system relies on an integration of several electronic machines connected by conveyor belts. It includes segregators which separate letters, packages and newspapers; automatic letter facers, which turn all letters the same way, cancelling them; and letter coding machines, which print phosphorescent dots on the letters based on the destination's postal code.

I suppose this is very repetitious to you, but to me it is quite interesting. The letters then are read by automatic letter sorters at a rate up to 20,000 an hour into individual stacks to be placed into bags for despatch or for postmen to begin their deliveries, and so on it goes.

I wonder how that compares with what we are doing in Canada?

Mr. H. D. W. Wethey, Director, Engineering Branch, Post Office Department: We are quite familiar with what is being done in Britain. A great deal more mechanization and automation of the mail can be done there because with their larger centres and larger volumes it is economical. We have in fact some of the elements that you have just described in Canada for the segregation and automatic facing up and cancelling of mail. We have sorting equipment for parcels, although not yet for letters.

In the larger centres, where the best economies can be achieved in mechanization, Montreal and Toronto, the present state of the buildings is such that there is not room for mechanization and our efforts for those two cities at the moment are being bent towards the production of facilities which can contain mechanization.

Senator Kinnear: Thank you. I know that there is something wrong in Toronto, because I live in the Niagara area and I have not had mail under three days from here to Coburn, Ontario, which is just sickening. It has to go around Lake Ontario and get into the Niagara area. Also, I noted the Postmaster General admits the slowdown on March 5 at Toronto and Montreal; the problem is inadequate facilities; the volume has increased 85 per cent. You are the engineer?

Mr. Wethey: Yes.

Senator Kinnear: Are you planning any improvement in space, and when?

Mr. Hobbs: We have a project on to study Toronto and we have already completed the data collection phase which will tell us where the mail moves from outside the city into it, from inside out of it and within the city. We have our plans made and by the end of this year we hope to have the location of new facilities identified on the grounds of economy and speed of transportation between these centres. We hope to use exactly the same techniques we are using in Toronto, and in Montreal at a later date.

Senator Belisle: Mr. Chairman, can I ask a supplementary to this? Referring to the sorting of mail in Ottawa here, for instance, I presume that you have a central place where all mail comes in and then is distributed?

Mr. Wethey: This is correct.

Senator Belisle: Would you answer this question? Approximately a month ago a letter was sent to me from Sudbury addressed "Senator Belisle," but instead of being sent to 403 Simpson Road it was sent to 403 Alta Vista. I got it ten days after it had been forwarded to "7 Belisle," and it was addressed "Senator Belisle." Finally it was sent ten days afterwards to the Senate here.

Senator Kinnear: Just to point out the other side of the picture, today I sat alongside a lady from Mexico at lunch and she told me that they received a letter in just over 24 hours from here to Mexico City. I said, "I can almost walk home and it takes me three days to get mail." I do not mean to be facetious; those are just facts.

Perhaps you could describe now the model referred to on page 10 of your brief. This might help us to understand what you are doing, the development of a model for simulating the complete processing network?

Mr. Hobbs: Yes, I think I can describe that reasonably well. We know when mail comes into the Post Office in bags it must first be emptied from these bags and culled. These bags are emptied. Then the contents are culled, separating letters from small packets. Then the letters move through facing, cancelling and processing. Each of these is an operation which takes time and people and you can put a time value and a rate of processing to each one of these. You can

simulate this in a computer model and you can provide the link from process to process by imagining what would happen if we had a conveyor belt there moving at a certain speed.

You can virtually build a model of the network, representing the flow of letters through the post office. By running this model you can, if you insert given processing rates, find out how long it will take the mail from the time it comes in until the time it goes out and you can identify those areas where you need to improve your processing rate so as not to cause a bottleneck. This is basically what the model does.

Senator Kinnear: A great many people handle mail. A computer like they are suggesting for England not only sorts the incoming but the outgoing mail and would reduce the manpower to about one person. Now, I do not think we want to be too fast in adopting that method unless you have other jobs in sight.

The Chairman: Before we go on, Senator Kinnear, can I ask a supplementary question about this model? When did you start to develop this?

Mr. Hobbs: Which one are you referring to; the first or the second one?

The Chairman: The first one?

Mr. Hobbs: We started the docking model in 1966, shortly after the operational research branch was formed. It was operational in 1967.

With regard to part (ii), the development of a model for simulating the complete processing network of the internal workings of a post office, that was started in 1967 and was completed in September 1968.

The Chairman: Do you not think that we were a little bit late in starting these studies and using, or at least developing and adapting, these new methods to our own system?

Mr. Hobbs: Sir, the branch was only started in 1966, so that really I do not think the department as far as I am aware had a capability to do this prior to that date.

The Chairman: No, the department existed, so why was the branch established that late?

Mr. Hobbs: I do not know, sir; that is when I came to the department.

The Chairman: Then we have developed the method and we do not have the housing facilities now, so we will have to wait?

Senator Kinnear: Apparently the housing facilities are very short. Then, also, I notice in the *Toronto Globe and Mail* of Tuesday of this week that private mail delivery service has been started in British Columbia and will move east. It is by the same company which started in Oklahoma, and somewhere I read, and I believe it to be true, that private enterprise can make money where other corporations cannot. Have you gone into this business and looked over what they are doing about providing mail delivery? Do you think it is a good idea?

Mr. Hobbs: I think that is a question for Mr. Myers.

Senator Kinnear: And will it spread throughout Canada?

Mr. R. D. Myers, Acting Director, Postal Service Branch, Post Office Department: What is happening here, of course, is that private enterprise is looking at the best part of the business where they can make a dollar. We are now going into the market research business to take a look at the whole thing. There is no question, in my mind at least, that a competitor can select any given portion of the business and make a profit on it. We are looking at the total business of the Post Office. Traditionally we have been in, for instance, the savings bank business. We are out of that now because it is no longer economical, and the private sector looks after this end of things more economically than we do. I do not think that that is a bad thing.

Senator Kinnear: Do you mean going out of the savings bank?

Mr. Myers: I mean private industry; if it becomes more economical for them to do it then I see no reason at all why they should not.

Senator Carter: Could I have a supplementary here?

The Chairman: Were you finished with your answer?

Mr. Myers: Yes, except I would like to make this one point, that I think we are probably going to become a great deal more competitive in the future when we get this kind of study organised and are able to handle larger volumes.

Senator Kinnear: I am still not quite sure that you have done an investigation into how the private mail delivery is working and

whether you recommend that it be continued across the country?

Mr. Myers: If I understand right, this particular private mailer, he is doing nothing more nor less than what has gone on for as long as I certainly can remember. We have firms in almost every city in the country who deliver householder mails, samples.

Senator Kinnear: This is not door-to-door delivery then?

Mr. Myers: Oh, yes.

Senator Kinnear: I thought you meant taking it out to mailing boxes throughout a city; is he doing that too?

Mr. Myers: No. This company, as I understand it, is in the door-to-door business and is handling householder advertisements, samples, and so on. I think it has been called "junk mail," the kind of thing that we find a little expensive to handle.

Senator Kinnear: Thank you. I did have a question on junk mail here. The greatest complaint today that I hear about is the amount of mail that is discarded. Each time we receive mail there is so much advertising and so many free gimmicks, and so on, that waste paper baskets are filled with it. Is that the kind of mail you think can be handled more cheaply by contract?

Mr. Myers: I am not sure that it necessarily is done more cheaply by private industry. You see, there are several types of mail. The mail that goes around to every household in the district without an address and is simply delivered from door to door without pre-sorting can be done relatively cheaply by a private firm if it hires labourers at the minimum wage rate. This tends to become a sideline for us, because we are in the business of sorting addressed mail, but it does not necessarily mean that in the sum total that industry can, just by virtue of being a private industry, do it more cheaply than we can. But this is the mail that I am referring to.

The Chairman: Would that include political propaganda?

Mr. Myers: It could.

Senator Carter: I think you have just about answered my supplementary. What I was concerned about is. If I understand you correctly, you said you were looking after the whole picture before you plunged into this. It seems

to me that you could very well farm out the "cream" to a private company and then be left, like the trains, where the trucks and the express companies skim off the cream.

The Chairman: Or the CPR.

Senator Carter: Yes. The trains are worse off than they were before, and this could very well happen to the Post Office Department.

Mr. Myers: This is really precisely why we are going into the market research business, because traditionally this is exactly what has happened. At one stage in the game the Post Office was the communications business in Canada, and as the newer media came along they took over bits and pieces of it—this has been true down through history with the telephone, the telegraph, and so on. Express companies, for instance, have with their present structure deliberately selected the most profitable end of the parcel handling business and left us with the rest.

We think that we need to look at the total picture, hence the market research, to simply see where we can fit in and do the most efficient job, because we after all do have an enormous distribution system and it is up to us to find the most efficient way of utilizing it.

Senator Robichaud: I am sure that the Post Office Department is receiving a lot of complaints about delays in mail delivery. Now, what I would like to know is how much effort is being done on the part of the department in order to investigate and find, exactly pinpoint, the reasons why these delays occur. I will give examples which are so evident.

If you go down on Tuesday morning, say, after 10 o'clock, after the first mail has been delivered to the reading room of the Senate or the House of Commons, you will find out that the latest newspapers on hand from the Maritimes are dated probably Thursday of the week before, which is five days late.

Now, at my home I receive two of those papers and on Monday I get the Saturday's paper.

Now, why is that? There must be something wrong, because those papers are published at the same time. They must be delivered to the post office at the same time. They are second-class mail. There I get it in about 24, or 36 hours, whereas it takes about 5 days for the newspapers to reach the reading room of the Senate or the House of Commons here.

Mr. Hobbs: I can say that we have a newly appointed director just recently who has been charged with looking into this type of problem and hopefully he will be able to solve it.

Mr. Myers: I would have said precisely this, that besides the long range problem we have right now, there are improvements being made every day in the situation you are describing. But it does remind me of a situation that I happen to know about. Some Maritime paper, or perhaps papers, and I cannot remember which ones now, were mailing the papers for the Senate and the House of Commons in with the Ottawa city mails. This is quite a different practice in our organization. So it got into the city process and went around the merry-go-round a little bit. As you know, you have your own post office and by the time it gets here I can see a delay of a day or two anyway. I am not going to explain 5 days.

Senator Kinnear: I think it is a terribly serious matter. I had to phone home because I was looking for an important piece of mail. I said, "Do not send it now, because I do not know if I will get it. I am leaving for home in 7 days and if you mail it it is going to take me 7 or 8 days to get it." However, I noticed that you said earlier that the mail for computer service needed to be in a condensed area of population and probably a small country. But this is what they say about Australia, which is anything but a small country. It was reported in the *New York Times* of April 9, 1968, that Australia is also introducing electronic aids. An Australian-invented electronic mail sorting system now being used in Sydney is so fast, efficient and economical that postal officials predict it will soon be installed in post office operations around the world. It is claimed that the system operating in Sydney sorts letters at the rate of up to 300,000 an hour into a memory bank of as many as 50,000 coded destinations within the post office.

Mr. Wethey: This is quite true. I have seen this installation and it is an excellent one. It was put into a brand new building especially designed to contain it. We are unable to put in a large-scale letter sorting installation in Montreal and Toronto until such time as we have buildings properly designed to take them.

If I may, I would like to add a bit about postal mechanization in general. Mechanization with materials handling, which is a matter of lifting the mail up and distributing it

and that sort of thing, is extensively used in Canada and there is no difficulty with it, but the automatization of the mail processing—that is the facing, cancelling and sorting—is an extremely difficult and uneconomic operation.

In industry if you are automating to make engine blocks or to fill boxes of corn flakes, the product with which you are dealing is one of uniform size and characteristics. If by chance there is some engineering or machine problem caused by the object with which you are dealing, it is under your control and you can alter it a bit to make it more easily machinable. In our industry, however, we are at the mercy or whim, as you might say, of the mailer and we are trying to apply modern techniques to a product the characteristics of which we have absolutely no control over at the moment.

Neither from an economic point of view do we have control over the volumes that are going to arrive at our plant or when they are going to arrive. I am sure you will realize that for the economic use of expensive machinery the ideal thing is to have a steady flow throughout the 8-hour shift or the 3 shifts of 8 hours in the 24 hours.

All postal administrations are faced with this difficulty. In the past the tradition has been that the operating people have come to the engineer and said, "We have a problem; would you please put wheels under it and mechanize it." Some of the best brains in the world in postal administrations have been bending their efforts towards this for a number of years, and none of them have a completely satisfactory or economic system.

Work is going on now in the Universal Postal Union and, in individual governments, towards the standardization of envelope sizes and, coming after that, the limitation within certain restrictions of colours of envelopes, because when you get into sophisticated equipment, not only are the letters handled mechanically, but they are read electronically and sorted through the use of a computer.

Our tradition, I suppose, is that mailer may mail whatever he likes in any form, but, like everything else in modern civilization, we are being closed in by the demands of the machine. Therefore, to make progress in mechanization we must do two things. We must first bring the range of things to be dealt with within the orbit of the machine. Then, having done that, we must bend efforts to make machines better than they are today in this field.

Senator Belisle: You are presently constructing a new building beside the Union Station at Alta Vista for sorting mails. Are you thinking of equipping it with the best of machinery?

Mr. Wethey: With the best available at the moment.

Senator Belisle: Is it available Canadian, or would it be at par with Australia?

Mr. Wethey: There would be nothing in it at the moment for letter sortation, because we ourselves are not satisfied yet that the systems used in Britain and Australia, which involve an operator coding on the envelope with phosphorescent dots, the destination of the letter and the letter being scanned electronically are the best for our purposes. We would prefer, since we are not at the moment being forced into it, to wait till the optical character reader is developed further, where the address is read directly.

Having a keyboard operator to code is something like the situation in the computer business where you must have a keypunch operator. Today that is being eliminated, and optical character readers are going to read documents directly and thus dispense with the intermediate human intervention. We are trying to do the same thing.

There will be in the new Ottawa terminal the most modern equipment for facing and cancelling of letters, and for sorting of parcels.

Senator Carier: You are designing the building, I presume, so that you can utilize these techniques when they come?

Mr. Wethey: Exactly; the floor loading is ample to take letter sorting machines, and the space and facilities are all there so that when automatic letter sorting is economically sound for us to use we will.

The Chairman: But why do you say that you are not forced to do this now, while other countries like Australia have already done so?

Mr. Wethey: The Australians have done it in Sydney, which is a very large city. At the moment it is not economically sound to go into it in a city like Ottawa with existing letter volumes.

Senator Kinnear: Could you try Toronto instead of Ottawa, with Toronto having a

population million and three quarters and Ottawa about three hundred thousand?

Mr. Hobbs: I think once we have our facilities located strategically, the problem at the end of this year will be passed to the engineering branch. I am sure Mr. Wethey is going to consider just this.

Senator Kinnear: I did want to ask one other question about the speed of mail delivery. How is the mail carried? Is it by air, or are you still using rail and truck, too? What are the percentages? Are you using helicopters at all from airports to postal department?

Mr. Myers: I do not know what percentage is carried by rail.

Senator Kinnear: You could almost guess, I would think, whether aircraft is used more than train?

Mr. Myers: For first-class mail, without any question; all first-class mail goes by air if it is faster by that method.

Senator Robichaud: Five days from Halifax.

Mr. Myers: Slow airplanes!

Senator Kinnear: What about trains? To what extent are trains used? Do you use them for newspapers?

Mr. Myers: Newspapers, parcels, circulars.

Senator Kinnear: What about trucks?

Mr. Myers: We use any sort of transportation, whichever is the most economical or provides the best service.

Senator Robichaud: Is there quite a tendency now on the part of the Post Office Department to transfer from train to trucks, particularly for distances within, say, a hundred to two hundred miles? Are trucks used more than trains now for such distances?

Mr. Myers: I think that is fair, yes.

Senator Belisle: Do you use piggyback also?

Mr. Myers: Yes, we use piggyback, or containers. We certainly use containers.

Senator Belisle: Coming back to the engineering branch, what kind of setup have you there? Have you got lathes and machinery? What kind of a staff have you?

Mr. Wethey: I will give you a very brief prepared comment, if I may: Research and

Development division does research and development concerning post office equipment and new mechanical, electronic and electrical mail handling machinery. It also investigates and reports upon the suitability of various types of existing new equipment, on related materials and processes and it makes recommendations concerning their adoption.

When a specific mail processing machine is selected from outside Canada it must be evaluated on live mail as it exists in Canada. This is done by the Research and Development division, either in our postal laboratory at our headquarters in Confederation Heights or in a working postal terminal.

It is a rather interesting fact that you cannot simulate live mail; you must do your testing and evaluation on live mail, and sometimes this is done at the expense of the speed of the mail but it is a thing with which we must put up.

Even dead mail, oddly enough, does not behave in the way that live mail does. I do not think people fully realize this. Dead mail loses its resiliency, and if it is being handled in letter form at high speed it does not "fly" in as nicely as live mail does.

Also this division is our technical liaison contact with other departments, with manufacturers and with research and development departments of other postal administrations. We keep abreast of what is being done in post offices in most of the advanced countries of the world. We husband our limited resources in research and development by ensuring that we do not duplicate fields already being explored by other countries.

Through the universal postal union and our own personal contact in the United States, Britain, Australia, Germany, Switzerland and the Netherlands we have easy access to the latest developments at no cost, but we also contribute our knowledge and developments in return.

In addition, this division manages controlled tests of materials and equipment as required by the post office. It operates a research workshop for the production of prototypes. I might say with respect to both of our workshops that we follow rigorously the Glasco Commission recommendations on make or buy; we do not manufacture things if they can be economically bought outside.

This gives you in a nutshell what the research and development division does. It has a small one; its total strength is 22.

The Chairman: Since when have you operated these shops?

Mr. Wethey: Since 1961, when we moved out to our new location at Confederation Heights.

Senator Bourget: What you do there, if I understand it, is to make the design yourself and develop the machine. Then if it is found acceptable, you ask a company to produce it?

Mr. Wethey: This is quite correct, but I would like to make it clear that we are not at the moment engaged in developing large, expensive, or complicated machinery; it is more in the line of perfecting and re-developing standard equipment, things like letter sorting cases. One small example is the bag rack, which traditionally has been made of welded pipe and is an expensive and bulky thing to ship and to store.

We have developed a new one which goes together with pieces of banded pipe, something like the tail piece of a car exhaust system. It can be assembled with a few simple bolts, a little like a child's tinker toy set. Actually, it will give you a variety of racks which, for shipment and storage, come in separate pieces to save space.

Senator Bourget: Whenever you have some difficult problems or you want to improve some kind of machine that you use, do you ask some private organization to do research or do you seek help at the National Research Council?

Mr. Wethey: Yes, we do indeed. We do not try to build within our organization skills or talents that can be obtained outside.

Senator Bourget: Then, how much of the funds expended in your engineering branch go out as extramural research?

The Chairman: Or development?

Senator Bourget: Or development?

Mr. Wethey: I would say a negligible amount; I am afraid I do not remember what in detail is shown under that heading. The table that we had in the brief showing amounts spent is practically all for internal. The big part is salary for employees in the division.

Senator Bourget: But whenever you transfer a research project to NRC does NRC charge the Post Office Department for it?

Mr. Wethey: Not in my memory do I remember giving anything in this particular way to NRC. They certainly would charge if we wanted a service. They have a schedule of fees under which we would pay them but, as I said earlier, we are so well acquainted with what is going on in the rest of the world that we do not have to do a very great deal in the intricate and expensive machinery side at all, and I think it better that we do not.

Senator Bourget: And you avail yourself of research that is conducted outside this country?

Mr. Wethey: That is right.

Senator Bourget: Very much so?

Mr. Wethey: Yes.

Senator Bourget: As far as machinery that you need is concerned?

Mr. Wethey: Yes, sir.

Senator Bourget: In the research that you have been doing in your engineering branch have you developed some patents?

Mr. Wethey: Yes, I think a small number, about 7 patents—some of them to do with the handling of pieces of mail at high speed.

One had to do with a special lock for mail bags. The lock operated quickly and easily. Another had to do with a theft-proof mail receiver for the wall of a small post office.

We did have complaints that sometimes on weekends naughty boys would open the receiver and take a stick with a piece of chewing gum on it and poke down and retrieve letters that were dropped in. So we invented a device which as you opened the door to put your letters in brought a slide down at the back, something like the night depositories in the front of a bank.

Senator Bourget: Has this patent been licensed to some private company?

Mr. Wethey: We passed the design to the Department of Public Works, which is responsible for providing this equipment to buildings. I must confess I do not know what they have done about it.

Senator Bourget: Are there other countries who have been interested in that particular patent?

Mr. Wethey: There may have been. We have dealt through Canadian Patents and

Development Limited, and if it were a marketable patent I am sure that we have.

Senator Bourget: But you are not aware of that?

Mr. Wethey: I am not aware of this particular thing.

Senator Bourget: And the patent was taken only here in Canada and not in other countries?

Mr. Wethey: To the best of my recollection.

Senator Bourget: And you have not talked to private industry to find out if they would be interested in developing that kind of a patent so that they could get some revenues, and indirectly the department could also get some revenues?

Mr. Wethey: I must confess we have not, to the best of my knowledge, in this particular thing.

The Chairman: It would be, I suppose, the specific responsibility of Canadian Patents and Development Ltd. not only to see that this patent is used but also to derive the revenues. It would not go to your department?

Senator Robichaud: When we drive through rural areas where rural routes are established, we see all kinds of mail boxes. I remember in the old days they even used discarded nail kegs. They do not have them any more, because they are not used for packing nails. Some mail boxes are on the road, others are on the side of a ditch—you see them all different ways. Are there any postal regulations to determine the use of such boxes, and particularly the way they should be placed?

Mr. Myers: Yes. We have regulations about this but they all relate to the size, to weather-proofing, and this kind of thing. We do not interfere with the citizen's right.

Senator Robichaud: Who could enforce such regulations?

Mr. Myers: We police it all right.

Senator Belisle: Do you deal with the municipality?

Mr. Myers: No, it is private.

Senator Belisle: But you make your request through the municipality that you want the mail boxes on a certain side of the road.

Mr. Myers: I am not at all sure that we even do that; we are talking of the rural mail boxes?

Senator Belisle: Rural mail, yes. I was a mayor 15 years ago and I received a communication from the Post Office Department requesting that rural mail boxes be placed.

The Chairman: Did you comply with their request?

Senator Belisle: Yes, we did, and we had some arguments with rural mail box owners. We passed a bylaw in Sudbury.

Senator Carter: I wish one of the witnesses would explain this last column of figures at the bottom of page 5 dealing with funds expended. It is under your research and development division—expenditures associated with scientific activities. Under the heading of capital, you have, \$5,000.00 for 1962/63; \$15.7 thousand for 1963/64; \$21.3 thousand for 1964/65; only \$1.1 thousand, 1965/66; \$3.8 thousand, 1966/67. Then you jump up to \$60.5 thousand all of a sudden. There is a very great lack of uniformity there. I wonder what is behind that?

The Chairman: Of course, these are capital expenditures. They are irregular by their nature, but I am sure that we can have an answer.

Senator Carter: Yes, but there is a tremendous discrepancy from one thousand all the way up to sixty thousand.

The Chairman: You may even have constructed buildings for the purpose of research and development.

Senator Carter: As I understand it, this is all capital, expended in connection with research and development.

Mr. Wethey: I am sorry. When I said that a part of the duty of this division, although its title is research and development, is to evaluate equipment obtainable from other countries and a part of that evaluation is buying one or two of these equipments. This has to do with the purchase of facer, cancelling equipment.

Senator Carter: So this represents the prices of the equipment that you were testing in any particular year?

Mr. Wethey: Yes, this is correct.

The Chairman: In connection with this, if I may be allowed, on the top of page 6 you have \$105.00 as funds for university education. What can you get for \$105.00 in terms of university education?

Mr. Wethey: These are courses where under Treasury Board regulations if a person wants to improve himself he may register for a night course and at the successful completion of the course half of the fees are repaid by the department: That is what these are. Our people in their own time are improving themselves.

Senator Kinnear: There are not many availing themselves of the opportunity.

Mr. Wethey: We have in the division only five or six engineers, in a total of 22 people.

Mr. Hobbs: If I could make a general statement on the cost of the evening courses, I can tell you that the one I took the year before last cost approximately \$100.00. I think this is normal for evening courses, and if the department refunded half of the fees this would be \$50.00, so that the sum of \$350.00 in 1963 to 1964, for example, would represent 7 men taking courses.

Senator Carter: Could I come back to page 3, paragraph (h) where you talk about the feasibility study and the advantages of a Crown Corporation? I am one of those people who think Crown Corporations should be kept to a minimum because they are buffers between the Government and the people, and particularly where the Government is performing a public service. It is only a few days ago, or a couple of weeks ago, that the Postmaster General came out with some new changes, new regulations, with respect to the mail; and there was quite a little outcry about it and he had to backtrack on some of it. I wonder what would have happened if we had a Crown corporation? Is that a part of your feasibility study?

Mr. Hobbs: Not as far as I am aware.

Senator Carter: How long has your study been going on?

Mr. Hobbs: I have a list of the studies here. We did small preliminary studies in October and we actually got on to the true studies, identifying the actual studies that we ought to do, starting in November.

The Chairman: Was not that a recommendation of the Glassco Commission?

Mr. Hobbs: I do not think it was.

Senator Carter: Are there other countries in the world where the post office has been replaced by a Crown corporation?

Mr. Hobbs: It is certainly being considered in the same way that we are considering it.

Senator Carter: Where?

Mr. Hobbs: In England.

Mr. Wethey: The United Kingdom—and there is a commission report in the United States, where a recommendation was made that the United States post office should be a commercial corporation.

Senator Carter: Do you have access to their feasibility studies? Are they further advanced than we are?

Mr. Hobbs: We have access to all the documentation concerned. Furthermore, Mr. Wilson, who is special adviser to Mr. Kierans, was over in England a few weeks ago and discussed this quite fully. I personally have not examined all the documentation, but I understand it is there.

The Chairman: Why was it not in the Glassco Commission Report? Was this recommendation contained in the Montpetit Report?

Senator Belisle: I believe it was.

Mr. Hobbs: I have read it, but I do not recall it.

Senator Bourget: Are those studies made by the department itself or do you intend to get the help of some outside organization—because it will be, we understand, a very long study?

Mr. Hobbs: We do have the help of an outside organization at the present time. We identified six specific studies that we are working on with the firm of Kates, Peat, Marwick. In our preliminary studies, we identified these six studies as being so inter-related that they should be done with one company.

We did identify other studies which we hope will lead to improvement in our service in the very near future, and these are being let to other companies, other consulting companies, other than Kates, Peat, Marwick.

Senator Bourget: Do you have any deadline to complete them?

Mr. Hobbs: Yes, sir. We have a deadline for the completion of these studies and it is in August-September of this year.

Senator Bourget: For assignment and report?

Mr. Hobbs: This is a study to see what the implications of a Crown corporation would be. Perhaps I should say that it will lead to blueprint which will guide us in one direction or the other. This would not include, of course, any implementation.

Senator Robichaud: On page 6 of your brief you refer to research policy and you state that programs and projects are initiated and priorities are established according, first, to the needs of the postal operation service. Well, there is no question about the needs of the postal operating service. Secondly, the potential economies to be achieved—there is no question about that. And then, the third point, the acceptance by the operating staff of proposed changes. My question is whether you encounter much reluctance on the part of the operating staff? I would leave Saturday's delivery aside for the moment. However, do you encounter much reluctance on the part of this staff in accepting changes?

Mr. Hobbs: If these changes are well explained and are made perfectly clear, I would say no.

Mr. Wethey: May I add that we have adopted a policy so far as the engineering branch is concerned of introducing mechanization gradually with a careful course of explanation to the people involved. We are quite aware of the natural human resistance to change and the fear of the unknown. So we do our utmost to make certain that things are explained and we have had no trouble whatsoever so far.

Senator Robichaud: I see. I will skip No. 3. Coming back to 4, contract administration absorbs as much effort as in-house development for your scale of work, but this does not preclude future development being undertaken as a contractual basis, you say. My question is, if a mail contractor is on a rural delivery route or is transporting mail from one station or post office to another, or along a road which covers many post offices, and is giving good service, why does the department at the end of three years call or almost insist on calling for new tenders? Those people gather experience. They get accustomed to the work, particularly where they have long

routes, say, 50 or 100 miles with maybe 10 or 15 post offices along the way. They get used to that and they get equipped for it. They have the proper equipment and then at the end of three years the Post Office Department will call for new tenders and nine times out of ten, if they follow that policy, they will have to accept the lowest tender, which is much higher than the one which was in existence previously. Why this policy?

Mr. Hobbs: I am not quite sure, sir, whether that statement and the ones following it relate exactly to your question. I think it relates to the scientific aspect of our endeavours.

Senator Robichaud: Well, that may be so, but can you answer my question anyway? Why is the department following this policy?

The Chairman: You ask that as a supplementary?

Senator Robichaud: Yes. This is my main question, really. That is what I was leading to. This has been my experience in the past, and I was in the other place for 15 years and it was my experience there that the Post Office were advising me that they were calling for new tenders. If there are complaints, then I agree that there is justification for that. But in many cases they put people out of business first and then the new tender is substantially lower than the old one that was actually giving the service.

The Chairman: Even if it is outside our ambit, or at least not at the heart of our investigation, this perhaps is a good question.

Senator Robichaud: I ask it because they do mention contracts here.

Mr. Wethey: They had to do with developmental contracts mentioned, and only with that.

The Chairman: Would this kind of system be more or less forced on you by the Treasury Board regulations?

Mr. Myers: I am not even sure. I believe, however, that the contracts are written for five years now.

Senator Robichaud: Well, that is an improvement, in any event.

Mr. Myers: I am not sure how the next contract would be for more money, though. If the old contractor had his contract for X

number of dollars, surely he would put in at that rate the next time.

Senator Robichaud: No. He is taking a chance that he might get more money. They are all asking for more money. I am sure the department is well aware that the main complaint they are getting is from contractors who say they are not getting enough money. In many cases it is true, but what will happen when they call for new contracts? Either they have to give it for more money or they have to give it for quite a lot less. But then sometimes after six months they have to call for new contracts again because the contractor finds he cannot operate at that low price. So as I say they have to call for new contracts. This is one of the main complaints in the mail delivery particularly the kind of delivery I mention.

The Chairman: I suppose this has something to do with the average duration of parliament. Now that we have a majority government they have extended it to five years.

Senator Kinnear: At the bottom of page 7 where you mention "plastic street letter box"—is that the large letter box in which they store letters to be picked up and distributed?

Mr. Wethey: No, it is a plastic letter box about this high which is mounted on a pole. There is one near the Lorne Building at Elgin and Slater.

Senator Kinnear: Do you have a patent?

Mr. Wethey: No.

Senator Kinnear: I thought you would have. I had not recognized anything made of plastic in that line.

The Chairman: In general when you develop something that is new you would certainly try to have a patent on it would you not?

Mr. Wethey: Yes, if it is something original and new, we would. It would be mainly to protect ourselves from later on being overcharged by someone outside who might patent the same thing if we didn't.

Senator Carter: The list of projects in Appendix D, have these all been completed?

Mr. Wethey: No, some of them have had to be suspended because of higher priority work turning up. Were there any specific ones you wanted to ask about?

Senator Carter: No. You have quite a list there and I was wondering what period of time they represent.

Mr. Wethey: The year is represented in the first two digits and it started in 1959.

Senator Carter: Most of these or at least a good many of them would be completed by now. How many would be current projects?

Mr. Wethey: I am afraid I would have to start looking at each one in turn. I regret to say I do not have that data in the form in which you want it right now.

Senator Carter: Have you ever done any investigation to find something to replace the mail bags? You say you use containerization—big containers. Are these containers filled with bags and parcels?

Mr. Wethey: In some instances the parcels would be put in in bulk and in others the containers would contain bags.

Senator Carter: Are you convinced that bags are the best available type of container?

Mr. Wethey: No, not from an engineering point of view because a bag is a most awkward shape to handle on conveyers whether vertically or horizontally. But it takes a long time to find anything better, and we have not been in a position to put a major effort into it. There is a mail bag study committee in the department.

The Chairman: This is one committee I did not know of.

Mr. Wethey: There are so many current projects I am afraid we don't always have the time to sit back and think out the long-term uses of things.

The Chairman: How many members are on that committee?

Mr. Wethey: It is a small committee; I would say three or four.

Mr. Hobbs: May I add that some of the studies are being contracted out one of which is aimed at improving our present operation one is a study of containers which is scheduled according to my records here to take four months.

Senator Carter: I would think containers would be a very economical way of handling bulk mail. I was wondering if you could not adapt the container idea to smaller units, something better suited to your operations.

Mr. Hobbs: I sincerely hope that in the four-month study they will solve our problem.

Senator Robichaud: In Appendix E, paragraph 2 you mention:

Bulk handling of mails in wire mesh locked, wheeled containers moving between...

different points. How much is this being used, or is it only in the experimental stage?

Mr. Myers: Some are in regular use—(a), (b), (c), (d)—they all are.

Senator Robichaud: Those mentioned there?

Mr. Myers: Yes.

Senator Robichaud: Is it being done on a large scale or is only a small percentage of the mail handled this way?

Mr. Myers: In sum total it is only a small percentage, but going into the London, Hamilton, Kitchener area represents by far the bulk of the mail moving between Montreal and these points.

Senator Carter: Is that surface mail only?

Mr. Myers: Yes.

Senator Carter: What about Air Canada?

Mr. Myers: We are using Air Canada containers. This is one of the problems we have in this business. You have commercial containers used by railways, trucking and shipping companies, and so on, and generally you have to fit your modules into their containers, but it is not always suitable for us.

Senator Carter: These are developed and owned by the Post Office; these are not containers from the railways like the Air Canada ones? You say you get them from Air Canada, but these wire mesh containers are your own containers, are they?

Mr. Myers: No, in the case of the first one they are C.N.

Senator Carter: You have under Appendix E, section 2: "Containerization... Bulk handling of mails..." Then you have "(a) Montreal, Toronto, Hamilton, London and Kitchener" and so on—(a), (b), (c), (d), and (e).

Mr. Myers: Yes.

Senator Carter: Are these wire mesh containers commercial containers or containers owned by the Post Office?

Mr. Myers: In most of these cases we have developed them ourselves. In the case of the British and foreign post we are using the regular, commercial ship containers.

Senator Robichaud: On the next page, page 2 of Appendix E, you refer to "Government Operated Motor Vehicle Transport", and you say at the present time you are using it in Windsor. Could you comment on that? How is it coming along? Is it more satisfactory?

The Chairman: When was it started?

Senator Robichaud: How long has it been in operation?

Mr. Myers: Windsor has been in operation for a number of years. I am afraid I could not put an exact date on it. The Montreal, Toronto and Vancouver areas are in the experimental stage.

Senator Robichaud: When you say "in the experimental stage", to what extent? Does it cover 20, 25, 50 per cent of the mail handled in those areas, Montreal, Toronto and Vancouver?

Mr. Myers: About 20 per cent, I should think.

Senator Bourget: Have you found that it is cheaper to have this mail handled by the Government or by private enterprise? Have you some statistics on that?

Mr. Hobbs: This work at Windsor has been going on, as Mr. Myers has said, but the evaluation of it is being done in one of our studies under way at the present time, to see if it is economical, and if it can be employed elsewhere and show the same economies.

Senator Robichaud: If it has been going on for so long, and they are only now proposing to experiment with the same system in Montreal, Toronto and Vancouver, cannot we deduce from that that the Post Office department is far behind in adapting to modern methods, or, at least, in assessing the value of a system that it has in operation.

Mr. Hobbs: I believe, sir, that if you put in something like a Government-operated motor transport system in Windsor, you must let it run over several years before you can evaluate it. It has got to settle in, I do not think we have been that tardy.

Senator Belisle: Are you referring to the cost or to the service?

Mr. Hobbs: Well, to both.

Senator Robichaud: You refer here to significant savings in selected areas.

Mr. Hobbs: Yes.

Senator Carter: I should like to ask you about this mechanized money order system. When one goes out to an airport he can write out an insurance policy on a machine. I do not see why we could not have that type of machine for money orders. I am thinking of a machine on which you could fill out the money order, stamp it, and there it is. After all, the getting of a money order now takes a little bit of time.

Mr. Hobbs: Yes, sir. Hopefully our new money order system will answer your question. I understand that we are due to start it next year.

Senator Carter: It will be something along that line, will it?

Mr. Hobbs: Well, our money order will be in three parts with carbons between. You will fill this in yourself, and the number of the office where you bought it will be imprinted on the money order by means of a machine that is rather like a cheque writer. You will, of course, retain your portion and the other portion will be sent in by the Postmaster to our headquarters where we will have a computer...

Senator Carter: Why do you not just send out printed cards. You do not need a machine for that.

Senator Robichaud: Chargex.

Mr. Hobbs: This is one of our competitors. There is a study which was completed just today, and I have not yet seen a report on it, on environmental forecasting. We hope to keep this up to date, to show us what the environment in which we will be operating will be like, and where we can expect significant competition, and perhaps you have put your finger on one of the significant areas already.

The Chairman: Senator Kinnear, do you have any further questions?

Senator Kinnear: I am wondering about the zip code. It seems to be doing a tremendous job in the United States, which has ten times our population. When we are so slow with

our mail deliveries in very important areas of the country, why on earth cannot something be done to remove the difficulties?

Mr. Hobbs: One thing I might say here is that although the American zip code system operates at the present time, I was at a symposium about a week ago at which a gentleman who is considered to be extremely knowledgeable in this field predicted that it would encounter severe difficulties within the next ten or fifteen years because of the way it is designed, and because of the movement of population from one area to another.

Senator Kinnear: Are you considering one for Canada that is an improvement?

Mr. Hobbs: I would say yes, most definitely. We are considering it in our management information study at the present time. I myself have examined a geographic system, and we have a code committee. We put this idea to them and some form of coding is most definitely under consideration, but coding is not as easy as it would appear on the surface.

The Chairman: We have now a pretty good study on the future movement of population in Canada, and I am sure you are aware of those. Our movements may be less complicated than in the United States so I am sure that we are, from that point of view, perhaps in a better position than the United States to develop new methods for this.

Mr. Hobbs: I sincerely hope we are. The methods that we have examined have borne in mind this demographic shift. I think we may come up with a system which may be completely independent of movements in population and transportation. We have to bring a lot of attention to this.

Senator Carter: That is assuming that present trends will continue, but maybe we will have to alter those trends just to exist.

The Chairman: Are you in favour of a dictatorship?

Senator Carter: No.

The Chairman: This is one of the few statistical series in Canada at least which has not changed very much since 1950. I was looking at this just the other day, that the movement of urbanization, for instance, in

Canada has been going up systematically and at about the same rate for more than a century.

Senator Carter: But, it is creating monstrosities.

The Chairman: I agree.

Senator Carter: We cannot permit this. We will have to change.

The Chairman: I agree, but I do not know if the Government will have sufficient powers to alter the movement very much.

Senator Carter: I would not say that. I think economic policy could be designed to arrest it anyway.

The Chairman: In order to send more people to Newfoundland?

Senator Carter: Sure, we have lots of room.

Senator Robichaud: Lots of fish; I do not know about room.

Senator Belisle: Could I move the adjournment?

Senator Kinnear: I am satisfied, thank you. I am not satisfied with the answer, but I am satisfied that we should adjourn.

The Chairman: Before we adjourn, I understand that this move into the electronic age in the Post Office Department is fairly recent. I do not want you to criticize it or to accept it, but this is really fairly recent. In your view at the moment, are you making as rapid a progress as you can? You do not feel any inhibition in what you are doing through any artificial constraint by the so-called manipulators of Government funds?

Mr. Hobbs: No, sir. I just find it very difficult, as I think all organizations do, to find the sort of people that we need to do this work. This is my main problem. People seem to be in very short supply.

The Chairman: Thank you very much indeed. I am sorry that we have to adjourn at this moment. Perhaps we will see you in a couple of years to find out what progress has been made.

The committee adjourned.

APPENDIX "36"

BRIEF
TO
THE SENATE
SPECIAL COMMITTEE ON SCIENCE POLICY
BY
THE POST OFFICE DEPARTMENT

General Note

The paragraph and sub paragraph numbering used in this submission corresponds directly with the numbers used in the Guideline of the Special Committee, Part II, Section 2, "Content of Submissions".

2.1 Organization

- (a) Appendix A to this submission is an Organization Chart of the Post Office Department in which the units directly concerned are shaded, to assist in their identification.
- (b) The Post Office department reports to Parliament through the Postmaster General.
- (c) Appendix B to this submission is a block diagram indicating the organization of the Research and Development Division.

Appendix C to this submission is a block diagram showing the organization of the Operational Research Branch.

- (d) The Post Office Department has no formal agreements regarding scientific activities, with organizations outside of Canada.
- (e) The Department has no overseas offices.

2.2 Organizational Functions

- (a) The function of the Post Office Department is:

within the terms of the Post Office Act, to develop and maintain a nationwide network of postal communications and other services to all sectors of the Canadian community and contribute to the social and industrial growth by providing efficient communications and services at the lowest possible economic price.

While the Post Office Act contains no specific statutory references to scientific activities, it is Departmental policy to apply scientific methods, where possible, to the solution of important problems.

- (b) Standard commercial equipment and processes are employed wherever possible. Where necessary, new adaptations are sought from industry and commerce. Special equipment is developed only if an economic advantage can be shown or if it is essential to maintain a consistent standard of postal service.
- (c) Primarily through the Engineering Branch, the Department monitors and evaluates the development work of other Postal Administrations in terms of its possible value for application in the Canadian postal system. This involves regular personal contact between officials of comparable rank and responsibilities, by exchange of visits, correspondence and reports. The Canada Post Office has no overseas offices or agencies.
- (d) Cost-benefit analysis is used in the selection or design stages of equipment or systems. A service-wide production control programme and cost ascertainment system provide for a regular review. Methods and standards are revised as necessary or where a need is indicated.
- (e) Outside studies commissioned during the past five years, to suggest improvement in the Department's operating procedures, are as follows:
 - (i) Contract Assessment Formula—Development
by Stevenson and Kellogg Limited—1963.
Improve and up-date the methods of assessing the fair value of City and Highway transportation services contracts and establish standards for land mail costs.
 - (ii) Flexible Budgetary Control Programme
by Stevenson and Kellogg Limited—1964.
A survey and report with recommendations for a comprehensive budgetary system consistent with Post Office operating requirements.
 - (iii) Cost Ascertainment Programme
by P.S. Ross and Partners—1964.
The design, testing and implementation of a sampling programme to produce cost and revenue data covering the services offered by the Post Office, with a known and acceptable standard of accuracy. Training Departmental personnel.
 - (iv) Second Class Mail, Cost Survey
by P.S. Ross and Partners—1965.
Develop detailed data, covering all cost factors for second class mail, with specific data on certain publications.
 - (v) Royal Commission on Working Conditions in the Post Office Department
by the Honourable André Montpetit—1966.
An enquiry concerning grievances related to work rules, codes of discipline and other conditions of employment affecting non-supervisory operating employees, exclusive of salaries.

- (vi) Organization Study—Planning and Administrative Services of the Post Office Department
by Public Service Commission—1967,
- (vii) SCERT simulations for Selection of a Computer System
by P.S. Ross and Partners—1968.
- (f) The Post Office Department's activities and programmes as referred to in this report are restricted to and consistent with its responsibilities and powers in providing postal service and with the highly specialized nature of its operational problems.
- (g) We have not experienced, nor do we foresee new or major hindrances to performing our functions of a scientific nature, as referred to in this report. The subsequent sections of this brief refer in part to specific areas in which we forecast future study.
- (h) We are currently engaged in a study of the feasibility, advantages and possible disadvantages of operating the Canada Post Office as a Crown Corporation. One of the major areas of study is Organization. These studies are just beginning and any attempt to forecast the results would be purely speculative.

2.3 Personnel Policies

- (a) The normal recruiting programme of the Public Service Commission is employed for hiring members of university graduating classes.
- (b) No unique criteria have been or are being developed to help identify those who will be creative and effective researchers.
- (c) Normal employee appraisal and performance review programme is employed.
- (d) The standard Public Service Commission classification review and assessment techniques are employed.
- (e) The standard Treasury policy for extramural education is observed.

2.4 Distribution of Activities

The scientific activities of the Post Office Department, as referred to in this report, and the funds expended in this respect (supplies, materials and salaries) are entirely Headquarters oriented and are made predominantly in Ontario and Quebec.

2.5 Personnel Associated with Scientific Activities

- (a) Personnel establishment of units conducting scientific activities. No guest workers, staff-on-loan or post-doctorate fellows.

	Research & Development Div.	Operational Research Br.
Scientific and Professional	5	7
Technical	7	6
Supporting Personnel	10	1
Waterloo Univ. Co-op Programme	0	4
Summer Students	0	2
(b) Professional Staff devoting most of their time to administrative duties	1	3

(c) *Professional Staff Associated with Scientific Activities*

	Research and Development Div.		Operational Research Branch		
	Bachelor Level		Bachelor Level	Master Level	
(i) Country of birth	Canada	— 2	Canada	— 4	
	U.K.	— 2	U.K.	— 1	U.K. — 1
	Germany	— 1			India — 1
(ii) Country, secondary education	Canada	— 2	Canada	— 3	India — 1
	U.K.	— 3	U.K.	— 2	U.K. — 1
(iii) Country of University degree	Canada	— 2	Canada	— 4	India — 1
	U.K.	— 3	U.K.	— 1	U.K. — 1
(iv) Work years since graduation	Average	— 22	Average	— 4	Average — 12.5
Years in present Organization	Average	— 7	Average	— 2	Average — .75
(v) The Average age	45		30		36.5
(vi) Operate effectively in Canada's two Official languages	none		60%		none

(d)

Number of staff by year and level

1962	4		
1963	4		
1964	4		
1965	4		
1966	6	1	1
1967	6	2	2
1968	6	4	3
1969	7	6	3
1970	8	8	3
1971	8	10	4
1972	8	11	4
1973	8	12	4

(e) Turnover of professional staff 1962 to 1968 inclusive Research and Development Division—nil except

1964 — 25%, and 1965 — 25%

Operational Research Branch one member per year.

(f)

Current professional personnel
who have been employedResearch and
Development Div. Operational Research Br.

(i) by industry	100%	43%
(ii) on University staff	none	14%
(iii) by Provincial Government	none	none
(iv) other Federal agencies	40%	57%

(g) There are no staff members on education leave.

(h) Number of University students given summer employment

Research and Development Division—1967—one

Operational Research Branch—1966—four, 1967—three

2.6 *Research and Development Division—Expenditures Associated with Scientific Activities*

(a) Total funds spent (includes salaries, superannuation, space usage cost):

Functions: 1. Intramural Research and Development
 3. Scientific Information
 4. Testing and standardization

Scientific Discipline: Engineering and Technology (only).

Area of application: (16) Other (provision of engineering support to mail processing)

	Intramural R & D (<u>thousands \$</u>)	Scientific Information (<u>thousands \$</u>)	Testing (<u>thousands \$</u>)
1962/63	148.2	2.8	Nil
1963/64	215. ±10	3.3	Nil
1964/65	219.1	3.6	2.4 ±1.0
1965/66	207.7	3.9	18.7
1966/67	256.8	4.4	3.0
1968/69	209	6.2	99

(b) Funds expended:

	Operating (<u>thousands \$</u>)	Capital (<u>thousands \$</u>)
1962/63	146.0	5.1
1963/64	202.6	15.7
1964/65	203.8	21.3
1965/66	229.2	1.1
1966/67	260.4	3.8
1968/69	253.0	60.5

(c) Funds for university education:

1962/63	0
1963/64	\$350.00
1964/65	\$350.00
1965/66	0
1966/67	\$ 65.00
1967/68	\$ 15.00
1968/69	\$105.00

Operational Research Branch—Expenditures Associated with Scientific Activities

- (a) Total funds spent, or estimated (includes salaries, superannuation, space usage cost and special services).

Functions: 1. Intramural R. & D.
 2. Data collection
 3. Scientific information

Scientific disciplines (2) (f) mathematics
 (3) (c) economics

Areas of application: (6) transportation
 (15) administration
 (16) other—postal systems.

Breakdown—in thousands of dollars

Year	Total	Functions			Scientific Discipline		Areas of Application		
		(1)	(2)	(3)	(2)(f)	(3)(c)	(6)	(15)	(16)
1966	29.5	27	1.25	1.25	24	5.5	5.5	12	12
1967	83.8	75	4.4	4.4	66	17.8	17.8	33	33
1968	137.2	126	7	7	110	27.2	27.2	55	55

- (b) See "Total" column, above. All expenditures are in "Operating" category.

- (c) Funds for University Education: 1968—\$152.00
 other years nil.

2.7 Research Policies

- (a) (1) and (2) The nature of our scientific endeavour falls into the category of development. Programmes and projects are selected or initiated and priorities are established according to:

- (i) the needs of the postal operating service,

- (ii) the potential economies to be achieved, and
 - (iii) the acceptance by operating staff of proposed changes.
- (3) Yes. The design and installation of a new type of slanted belt parcel sorter (1966/67).
 - (4) Nil. Contract administration absorbs as much effort as in-house development for our scale of work, but this does not preclude future developments being undertaken on a contractual basis.
 - (5) No funding of extramural research.
 - (6) Not applicable in any appreciable degree. No significant difficulties.
 - (7) Not applicable.
 - (b) Not applicable.

2.8 Research Output

- (1) (2) and (3)

	Patents Granted	Licenses Issued	Articles Published	Reports Issued (Intra-mural)
1962	1	0	0	0
1963	0	0	0	0
1964	3	0	2	0
1965	3	0	0	0
1966	0	0	0	2
1967	0	0	0	7

- (4) (5) (6) (7) (8) None.

- (9) No significant impact.

- (10) None.

2.9 Projects—Research and Development Division.

- (1) For list of projects 1962 to 1967, see Appendix D.
- (2) (a) Plastic street letter box. Conceived as a means of reducing maintenance and repair costs, and of improving the Departmental image by adoption of modern aesthetic designs, the box is made from fibreglass reinforced plastic (polyester) in three basic parts using matched metal moulding techniques. The design and development was either performed or administered by this agency, and boxes went into service in 1965. International interest has been shown by the United States and New Zealand Administrations.

- (b) Slanted belt parcel sorter. The concept originated in Australia, and was subject to modification by the British G.P.O. Both sources were recognized when a prototype machine was designed, fabricated and installed in the Winnipeg Post Office in 1967. Considerable difficulties were experienced owing to the configuration of other types of parcel sorting equipment already installed with which the slanted belt machine was required to be compatible.
- (c) Pitney-Bowes Mark II facer canceller. This commercially available machine, in widespread use by the United States Post Office Department was rented for twelve months to permit a detailed performance evaluation to be effected, in Toronto and Winnipeg, in 1966. The results enabled a processing cost to be determined which showed the machine to be economic, and as a result, the decision to adopt it for the Canada Post Office was made.
- (d) Steel sorting cases. Traditionally, all sorting cases for letters have been fabricated from hardwood, and only a limited number of sources are available at reasonable prices. A design has been evolved whereby sheet steel is formed into two basic shapes from which a variety of sizes of case may be assembled. Provisional estimates indicate savings in procurement cost of over 50%.

Projects—Operational Research Branch

- (1) However, a comprehensive description of the work of this Branch as related to the use and/or adoption of existing scientific knowledge, techniques and methods, is provided in the following:
 - (2) (a) Forecasting
 - (i) Based on the revenues and costs attributed to each class of mail as determined by the Cost Ascertainment programme, five year forecasts of revenues and costs are made, using econometric methods. These forecasts are based on mail volumes and are used to determine the timing and magnitude of rate changes and for the Programme Review reports.
 - (ii) A computerized forecasting system has been developed which forecasts the manhours to be consumed and total mail volumes to be processed by individual sections within a Post Office for all Post Offices under the Production Control System.

The system updates the monthly forecasts each month in the light of the most recent observations and forecasts twenty-four months in advance. Each section's model was developed using regression analysis for establishing trends, Fourier Analysis for seasonal trends and exponential smoothing for adjusting model coefficients on a monthly basis.
 - (iii) The Engineering Branch has a standing requirement for the long range forecasting of all significant mail streams in selected Post Offices for the purpose of facilities planning and systems design. Mail volume forecasts have been made for Calgary, Don Mills and London Post Offices using econometrics and trend analysis method. Forecasts were accompanied by growth factors, levels of confidence and confidence limits.

- (iv) A personnel forecasting system has been developed for the manpower planning division. The system predicts the number of vacant positions by location, class and level for any specified number of years in advance. In predicting vacancies, allowance is made for departure from the positions by transfer, separation from the public service, retirement and attrition.

(b) *Statistical Sampling and Analysis Techniques*

- (i) A continuous statistical sampling programme has been developed for collecting Cost Ascertainment mail volume data on a national basis every 28 days. The total population of Post Offices was divided into five strata and sample offices were selected within each strata resulting in a two way stratification cluster sampling programme for proportions, means, and ratios.

The mathematical statistical models for the random variables were subjected to a complete error analysis, to determine the sources of sampling and non sampling errors. In order to reduce errors and remove biases, sample sizes were changed and a revised method of analysing the data was developed.

The sample results are edit/audited and analyzed by a computer programme package on a 28 day basis. These results form the basis of the cost ascertainment report produced at the end of each year for the Canada Post Office.

- (ii) A sampling programme was designed to collect data on the arrival patterns and service time patterns of post office vehicles in the Edmonton Post Office. The sample sizes were first determined on an economical time basis and the data was analysed to develop probability distribution patterns. The variance in the distribution was examined on a sequential time basis for significance to determine whether further sampling was required. These distribution patterns were later used as input to a vehicle docking simulation programme. A random number generator was developed for each unique distribution pattern.
- (iii) A scientific method has been used to compute the number of points of delivery made by individual letter carriers on a particular day through the use of multiple regression analysis. This method is used to adjust the workload of letter carrier walks.
- (iv) A market analysis of the vending pattern of stamped envelopes and an assessment of manufacturing, transporting, warehousing and vending costs was made. From this analysis a new rate structure was developed and implemented to provide the Department with a fixed margin of profit. Subsequently, a second price market study was conducted to determine the significant effects of the new price structure and to verify predicted financial return.

(c) *Simulation and Optimization*

- (i) A model was developed for simulating a vehicle docking system for a Post Office. The purpose of this model was to provide the Engineering Branch with a design tool for determining the size and configuration of vehicle docking facilities. The

model is capable of simulating a number of vehicle services and can determine the maximum number of dock bays required to provide a specified service with predetermined queue lengths. The input required is the number of hours over which service is to be given, the simulation interval size, a distribution pattern for vehicle arrival rates and service rates and a specified maximum allowable queue length for the design day. The model operates on 360/65 IBM Computer.

- (ii) A computerized method of auditing the mail processing capacity of a postal operation was developed on an experimental basis. The model can simulate the present flow processing network and the flow of mail volumes along each path of the network on a discrete time basis. The model compares the capacity of a processing link on a time basis to the actual flow and determines the utilization factor of the system.

Using a stochastic matrix principle, the inputs to the model are moved forward and divided along each link on a discrete time basis. The model operates on an IBM model 360/65.

- (iii) The development of a model for simulating the complete processing network of the internal workings of a Post Office has been considered and is under development. This model will be capable of accepting a number of different mail input sources and processing them in a different fashion. The model will contain transmission links (conveyors, mobiles etc.), processor nodes, preprocess queues, post process queues and buffer storages. It will have the capability of adjusting the processor and transmission capacity based on queue size build up. The transition matrix for movement of mail through the network will be a stochastic matrix operating by successive multiplication on a discrete time basis.
- (iv) The development of a model for optimizing the intra-city transportation and mass processing of mail is also in its initial stages. The objective of this model is to determine the best number, function and location of postal processing facilities in a large city such as Toronto and Montreal. The required input to this model is the intra-city distribution matrix of mail volumes, the transportation costs, processing cost at each facility considered, and constraints on the movement and processing of mail.

(d) *Quantitative Analysis*

- (i) Using methods of quantitative and statistical analysis, a method of classifying postmasters positions was developed and programmed for a computer. The basis for the study was a survey of some 300 Post Offices in which a large number of variables measuring the activity in a Post Office were recorded and examined. Five significant variables were separated and a model was developed for evaluating the job classification of each postmaster individually based on these variables. The solution to the problem was found by developing a ranking scale and locating each postmaster on this scale through a system of weighting each variable in accordance with its importance and other constraints.
- (ii) A method of determining new levels of mileage rates for personal vehicle used for post office business was developed by breaking the cost of owning and operating a

motor vehicle into significant components. Each component was critically examined to identify the owner cost or operating cost which should be reimbursed. By using a method of weighting economic indicies associated with each type of cost, an overall index of operating cost was developed for the past ten years. Since the weights chosen were subject to error, a statistical error analysis model was developed to determine the sensitivity of the various assumptions made. The error analysis revealed that the final results were only affected within a small margin of error by errors in the major assumptions.

- (iii) The statistical model for the Cost Ascertainment revenue system consists of a two way stratification of three random variables whose product is taken to arrive at revenue estimates for 17 categories of mail. It was necessary to find the most significant sources of error in this model whose components were estimated from continuous field sampling. Using the variance estimates from the sampling programme, the model was subject to an analytical error analysis and each source of error was located and measured.
- (iv) A number of different types of processes occur in the Post Office since there are many different types of mail populations whose patterns fluctuate due to many outside demands. These demands tend to change the patterns of mail volumes, rates, growth trends, and flow distribution patterns. It is often necessary to fit curves to patterns such as the ton miles of mail moved by air, arrival rates of mail vehicles, average content of highway service vehicle etc. To fit these curves requires the use of regression analysis, logistic curve fitting techniques, Pearson curve fitting technique, trend analysis, etc.
- (v) Hypothesis testing, variance analysis and non parametric techniques must be employed in many problems in order to test for significant difference between means and proportions to separate sources of variation in processes and to draw sound conclusions from statistical studies.

Projects—Other Branches and Divisions of the Post Office Department

- (1) Appendix E to this brief is a list of projects performed by the Branches and Divisions of the Department that are not primarily engaged in research or work of a scientific nature.

The Senate Committee is undoubtedly aware of the difficulties in defining exactly those activities which are to be regarded as “scientific” within the terms of this brief. In cases of doubt we have included the item so as to ensure that the information we provide is as complete as possible and, with the knowledge that any item may be disregarded if it is not appropriate.

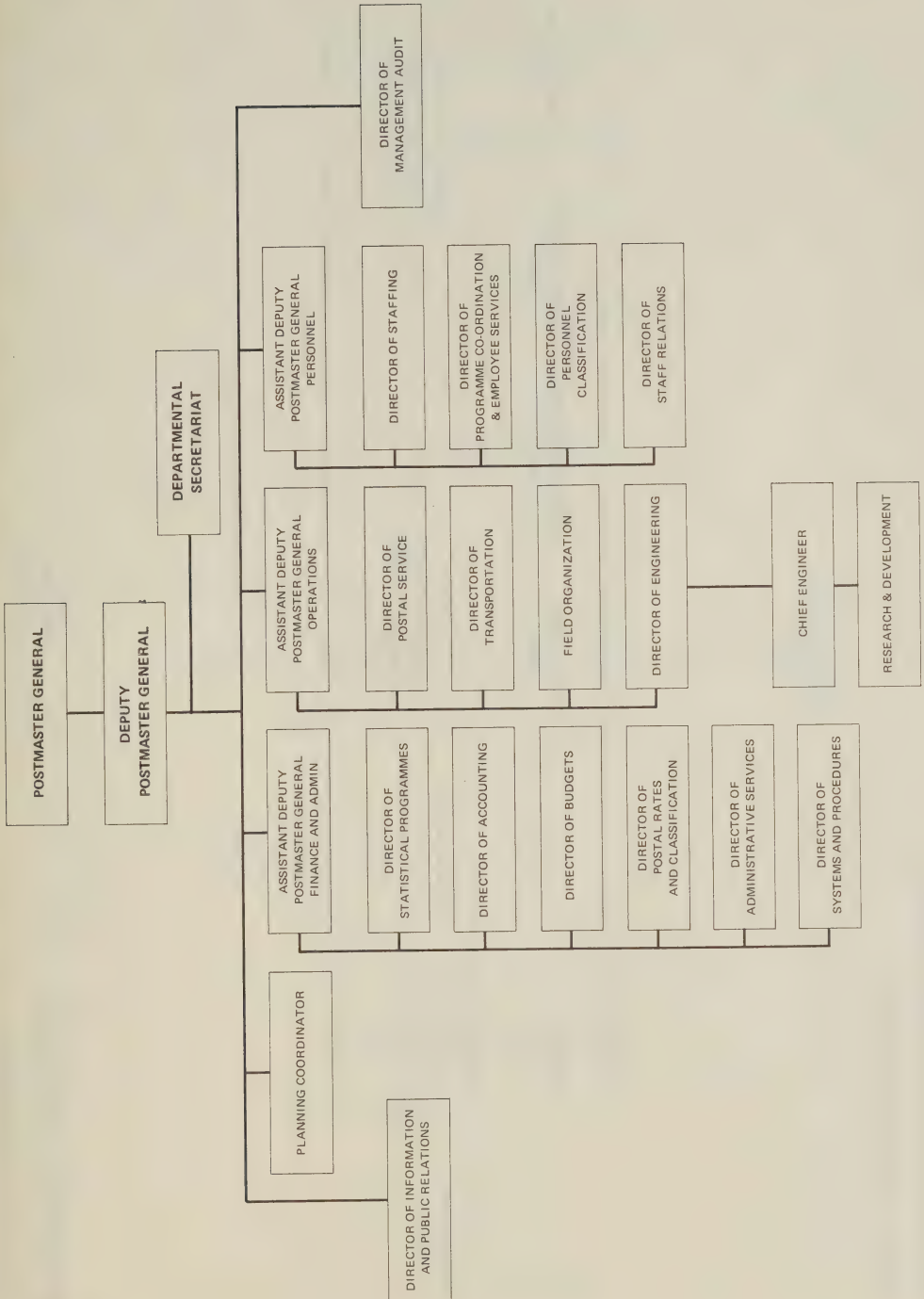
2.10 Effects of Scientific Activities on Post Office Operations

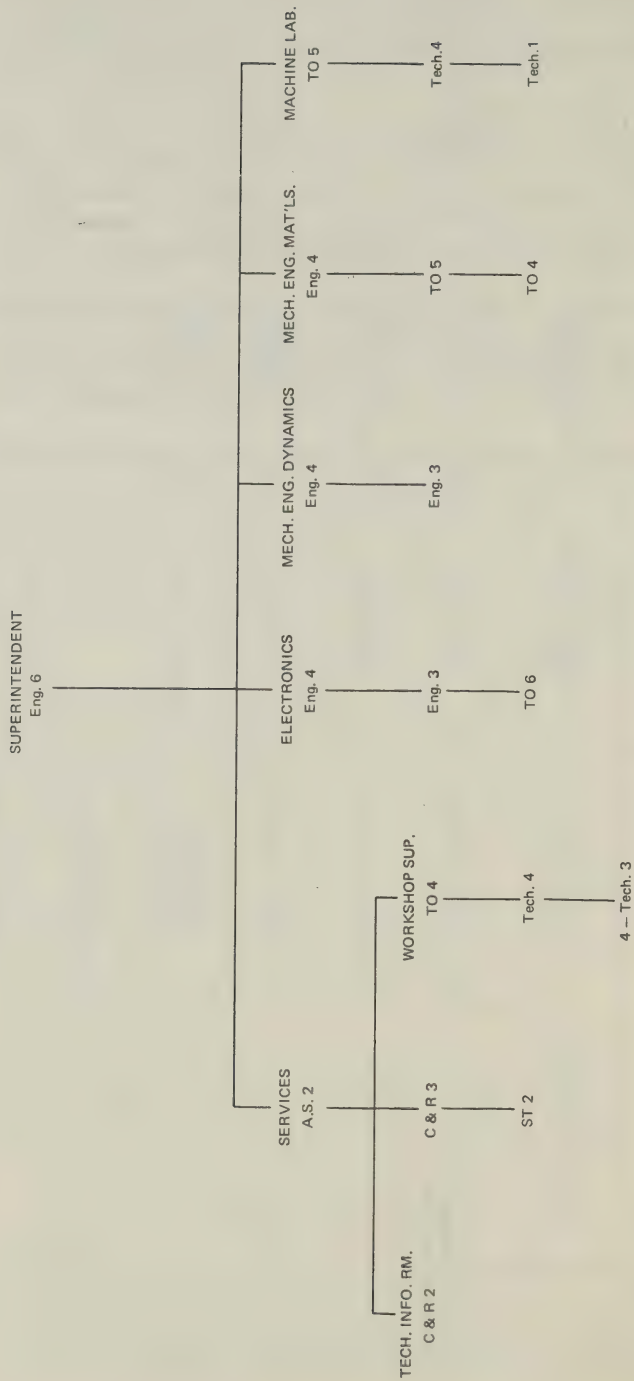
- (1) Forecasts of new techniques or equipment will be used for planning and construction of new postal facilities. Information may not affect the new facilities only as far as the kind of equipment, but also as far as mail volume is concerned, e.g., improvements in facsimile transmission may reduce the growth in mail volume.

The mechanical sorting of mail is an area of postal operations that is subject to current and future technical development. In particular, the development of optical character recognition equipment is receiving the attention of manufacturing firms. Their work is being followed closely by this Department, directly and through our liaison with other postal administrations.

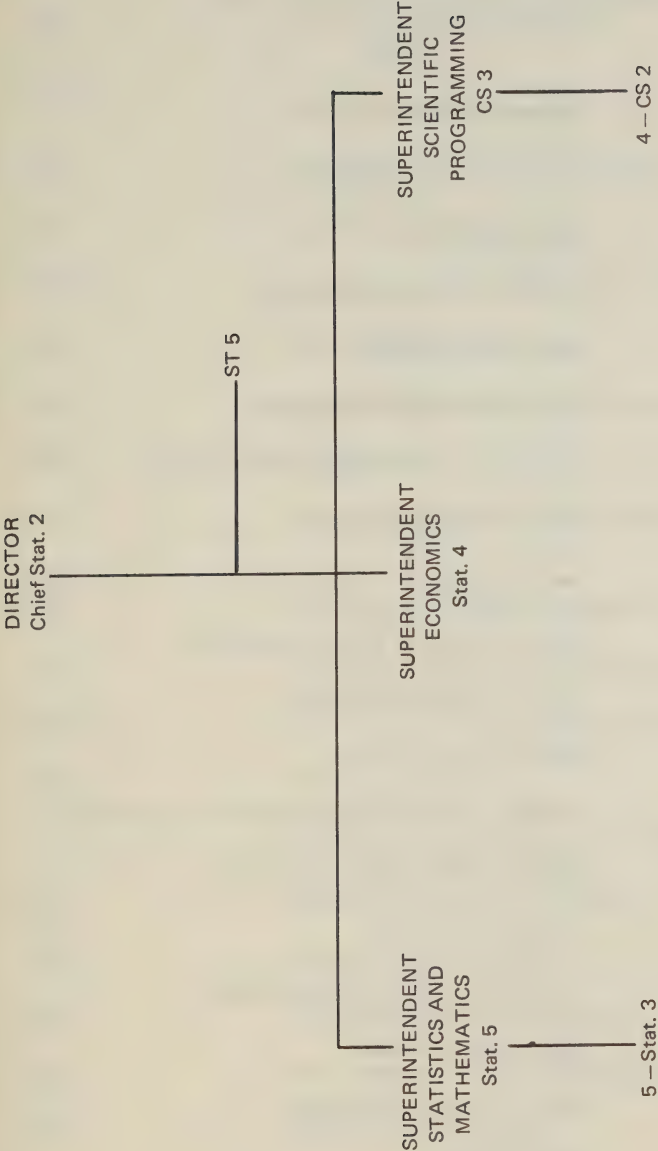
- (2) The "systems" or "total systems" approach is widely used in planning by this Department. There are studies in progress continually for new facilities, which involve consideration of improvements in the Department's effectiveness due to new developments of all kinds. It is expected that proposed organizational changes to improve the Department's planning will involve more general studies of this kind.
- (3) Advice has been sought from the Dominion Bureau of Statistics on forecasts of factors affecting mail growth (population, G.N.P., etc.). Advice on materials has been sought from the Departments of Public Works, Forestry, Energy Mines and Resources, and the National Research Council.
- (4) See comments in Sub Sections (1) and (2) above regarding systems planning.

APPENDIX "A"





POST OFFICE DEPARTMENT
ENGINEERING BRANCH
RESEARCH & DEVELOPMENT DIVISION



POST OFFICE DEPARTMENT
STATISTICAL PROGRAMMES BRANCH

LIST OF PROJECTS
RESEARCH AND DEVELOPMENT DIVISION

PROJECT NO.	NAME
59-1	Plastic street letter box
60-1	Keyboards for parcel sorters
61-1	Letter sorter's rest
61-2	Cummins stacker improvements
61-3	Money order imprinter
62-1	Rural mail identification marker
62-2	Coding desk for automated letter sortation
62-3	Sorter for coded letters
62-4	Test Equipment for SEFACAN
62-5	Stamp colours and colour recognition
62-6	Trays for handling loose mail
62-7	Manual facing-up tables
62-8	Markings—reflective for personnel and equipment
62-9	Markings—labels, signs, posters, etc.
62-10	Exterior mail receiver
62-11	Automatic stamp vending machines
62-12	Stamp booklet stacker
62-13	Photo cell conveyor controls
62-14	Parcel counters
62-15	Theft proof snorkel
62-16	Standing mail box
62-17	Modifications to SEFACAN

62-17-1 F/C	Finger-guard for destacker rack
2 F/C	Letter detector beam monitor
3 S/G & F/C	Letter detector beam lamps
4 F/C	Cancelling die head; one revolution clutch
5 F/C	Cancelling-die inking system
6 S/G	Improvements to long letter stacking (& electronic gauging)
7 S/G	Drum feed monitor
8 S/G	Improvements to operation of separating towers
9 S/G	Key extraction
10 S/G	Operation-indicators-repeater facilities
11 S/G & F/C	Replacement materials on devices for PVC cord belts
12 S/G	Through-put capacity of segregator drum
13 S/G	Letter transportation in grading towers
14 F/C	U.V. lamp monitors
15 F/C	Installation of G.P.O. destacketer modification kit
16 F/C	Shift register routine test facility
17 F/C	Thick/stiff letter extractor
18 F/C	U.V. scanner and letter extractor
19 F/C	Letter transportation in lower shelf U.V. section
20 F/C	Obstructions in letter path
21 F/C	EHT thermal delay relay
22 S/G	Wide letter extractor
63-1	Special purpose data recorders

63-2	Stamp tagging
63-3	Group mail box
63-4	Relay box
63-5	Mail bag lock
63-6	Load carrier for electrical tractors
63-7	Platform trucks
63-8	*Photo cell conveyor controls
64-1	Letter bundle banding
64-2	Slanted belt parcel sorter—general background
2-1	Background
2-2	Concepts
2-3	Electronic keyboard logic
2-4	Electrical wiring and logic:
	SD 17 memory unit
	Parcel induction monitor
	Gate desynch. alarm, indication and restoration
	Mechanical keyboard wiring
	Parcel exit No. 1
	Ball track selector
	Gate control system
	Control console
	Control wiring
	Circuit protection

* R&D Test Project

- 115 V a.c. primary power supply
- 6 V d.c. power supply
- 12 V d.c. power supply
- 48 V d.c. power supply
- 180 V d.c. power supply
- 64-2-5 Winnipeg installation
- 6 Quotations and contracts
- 7 Saunier Duval memory
- 8 Test and evaluation
- 9 Ottawa (R. & D. Div.)
- 64-3 *Letter singulator
- 64-4 *Porelon stamp tests
- 64-5 *Solenoids—stamp vending machine
- 64-6 *Theft proof mechanisms
- 64-7 *Stamp booklet stacker
- 64-8 *Bayonet bag lock
- 64-9 *Friden postage meter
- 64-10 *Spring motor—stamp vending machine
- 64-11 *International face-up and cancelling machine
- 64-12 *Cancelling ink settlement
- 65-1 Letter batching
- 65-2 Inks, pad and cancelling
- 65-3 *Mechanical keyboard for slanted belt parcel sorter
- 65-4 Tubs and trays for conveyor systems

- 65-5 *Sorting case labels—Dymo
- 65-6 *Tape reader
- 65-7 *Pitney-Bowes Mark II and mechanical tables (Toronto)
- 65-8 *Pitney-Bowes Mark II SEFACAN and mechanical tables
(Winnipeg)
- 66-1 Preculling device; bag opening station
- 66-2 *Parcel sorter No. 1 exit drive circuits
- 66-3 Poster display frame
- 66-4 *Prototype parcel sorter
- 66-4-1 Gate operation
 - 2 Auxiliary gate slaving
 - 3 Memory reliability
 - 4 Induction performance
 - 5 Sorter prototype
 - 6 Installation performance Phase II
- 66-5 Improved lock box stopper
- 66-6 *Roneo-Neopost postage meter
- 66-7 Container for knock-down bag rack
- 66-8 Letter carrier bundle tag
- 66-9 *Tagged stamps appraisal
- 66-10 Label and band trough—E-11 lobby box
- 66-11 Improved letter slide—standing mail boxes
- 67-1 Redesign: E-2 Work measurement tray
- 67-2 Redesign: Rotary date stamp

- 67-3 *Edger-Stacker/Mark II F/C evaluation
- 67-4 Trough Design—mechanical tables
- 67-5 Improved sorting cases
- 67-6 Redesign: bag racks

Miscellaneous

- 65-0-1 Tray shelf for B-2 table
- 65-0-4 Identification badges
- 80-0-6 Impact testing

PROJECTS

BY BRANCHES AND DIVISIONS OF THE POST OFFICE DEPARTMENT

NOT ENGAGED PRIMARILY IN SCIENTIFIC ACTIVITY

1. *All-up Mail Service.*

Domestic all-up mail service is the system by which all first class mail is carried by available air service, when transmission by air will expedite delivery, provided the piece does not exceed the limits of size and weight that may be prescribed.

This service first commenced July 1, 1948 when surface letters paid at first class rates, up to one ounce in weight, were given airlift on a space-available basis, due to the limited capacity of the aircraft then in use. On April 1, 1954, the weight limit was lifted to "Up to and including eight ounces" without space limitations. Premium air mail rates applied domestically only to mail weighing more than eight ounces if airlift was desired.

On November 1, 1968, the eight ounce restriction was removed and the service is now subject only to the weight limit of 25 pounds which is applicable to first class mail generally.

2. *Containerization.*

Scope — Bulk handling of mails in wire mesh, locked, wheeled containers moving between

- (a) Montreal, Toronto, Hamilton, London and Kitchener
- (b) St. John's and Port-aux-Basques
- (c) Montreal and Quebec (trayed mail)
- (d) British and foreign posts (Atlantic) and Canada
- (e) Other post offices subject to availability of equipment

Purpose — to reduce terminal mail handling, speed service and reduce costs.

3. *Motorization of Letter Carrier Routes.*

Commencement — 1959 to certain routes with special delivery problems.

New problem areas —

- (a) Conveyance of letter carriers from Post Office to commencement of route and return
- (b) Expansion of door-to-door delivery in towns having 2,000 points of call but no public transportation facilities
- (c) Continued expansion to suburban areas beyond public transportation

- (d) Increased costs of public transportation
- (e) Increased demands from employees.

Additional uses or expansion—

- (a) Delivery of relay bundles
- (b) Delivery of parcels
- (c) Street letter box collections.

4. *Combined Urban Services.*

Scheduling of street letter box collections, parcel delivery and special delivery services to permit combining all three under a single "Transportation" contract.

Advantages—reduced cost and improved service.

5. *Government Operated Motor Vehicle Transport.*

Scope—Present—Windsor

Proposed—Montreal, Toronto and Vancouver

Experimental operations—controlled simultaneous operation of government owned and leased vehicles by Post Office employees side-by-side with private contractors.

Advantages—significant savings in selected areas.

6. *Distributing Centres.*

Definition—a post office located in a city or town in the geographic or socio-economic centre of an area, used as the main receipt and despatch point for a number of smaller dependent Post Offices.

Purpose—to improve processing and delivery of mails for smaller dependent post offices and reduce congestion by by-passing larger terminal offices.

Additional objectives—

- (a) Faster handling of transit mails
- (b) Simplified distribution knowledge requirements for employees
- (c) Improved incoming and outgoing mail services
- (d) Base for development of a postal code.

7. *Letter Carrier Route Measurement.*

Purpose—to determine and assess increases or decreases in individual work loads.

Former basis for route adjustments—semi annual carrier self-check.

New method—developed on the basis of objective time standards and the application of Basic Motion Timestudy.

8. *Experimental Issues of Specially Gummed (DAVAC) Postage Stamps.*

While DAVAC gum has the advantages of being tasteless, non-curling and positive bonding, its use was discontinued because of the manufacturing difficulties attributed to DAVAC gummed paper.

- (a) Pressure sensitivity
- (b) Soft edges
- (c) The dust Factor

9. *Elastic Bands.*

Purpose — to replace twine to tie bundles of letters for transmission through the post.

Observations:

Savings per 1,000 bundles

*Materials	\$1.93
Labour	<u>3.64</u>
	\$5.57

* (bands are reused 6.35 times)

10. *Analytical Method of Training Staff.*

Major objective —

- (a) improve accuracy of letter sorting
- (b) reduce time to bring personnel to a satisfactory production level.

Technique — Exercises to improve perception, recognition, manual dexterity and stamina.

11. *Cost Ascertainment.*

An accounting system designed to allocate costs and revenues to each class of mail and postal service.

Operation — Employs various statistical sampling techniques as the basis for data collection on a continuing programme to assemble basic data at carefully selected points in the postal service.

Product — An annual report containing pertinent and detailed cost and revenue information on postal activities, mail volumes and special services.

Basic Purpose — Reviewing, formulating and revising postal rates and fees.

Other source material — Census statistics, price index data and wage rates.

12. *Standardization of Envelopes.*

To introduce Universal Postal Union standards for envelope sizes and the weight of paper for envelopes.

Purposes — To rationalize mechanical and manual treatment of letter type mail within the postal service.

13. *Mechanization of Money Order System.*

A new money order system is being developed that will speed up service to the patron, permit automated accounting and financial control, and reduce costs of administration.

14. *EDP System for Production and Cost Control.*

A system of electronic data collection, processing and transmission is being developed to produce, economically, the information required for efficient and effective control of the increasingly complex field operations of the post office. The first system is being introduced in the Toronto Post Office and will be extended to all major post offices in Canada.

By analysis of the statistical data obtained, the Postmaster and Supervisors will be able to forecast mail volume receipts and, accordingly, counteract with effective staffing arrangements.

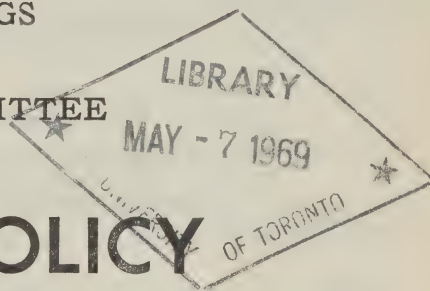


First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 38

WEDNESDAY, MARCH 12th, 1969

WITNESSES:

DEPARTMENT OF EXTERNAL AFFAIRS: Marcel Cadieux, Q.C.,
UnderSecretary of State; James Coningsby Langley, Assistant Under-
Secretary of State; D. M. Miller, Legal Planning Section, Legal
Division; Jacques Gignac, Head, Cultural Affairs Division; and Marc
I. Dolgin, Cultural Affairs Division.

APPENDIX

37.—Brief submitted by the Department of External Affairs.

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird
Belisle
Blois
Bourget
Cameron
Carter
Desruisseaux
Giguère

Grosart
Haig
Hays
Kinnear
Lamontagne
Lang
Leonard
McGrand

Nichol
O'Leary (*Carleton*)
Phillips (*Prince*)
Robichaud
Sullivan
Thompson
Yuzyk

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, March 12th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Aird, Bourget, Carter, Giguère, Grosart, Haig, Hays, Kinnear, Lang, McGrand, Robichaud, and Yuzyk—14.

In attendance:

Philip J. Pocock, Director of Research (Physical Science)

The following witnesses were heard:

DEPARTMENT OF EXTERNAL AFFAIRS:

Marcel Cadieux, Q.C., Undersecretary of State; James Coningsby Langley, Assistant Undersecretary of State; D. M. Miller, Legal Planning Section, Legal Division; Jacques Gignac, Head, Cultural Affairs Division; and Marc I. Dolgin, Cultural Affairs Division.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 37:

—Brief submitted by the Department of External Affairs.

At 5.30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

Curriculum Vitae

Cadieux, Marcel Q.C., Born in Montreal on June 17, 1915. BA (Grasset Coll., Montreal, 1936); LSEP, LL.L (Univ. of Montreal, 1939); post graduate studies (McGill Univ., 1939-40). Created Q.C. 1961. Joined External Affairs as Third Secretary August 1941; Third Secretary, London, January, 1944; Second Secretary, Brussels, February 1945; Ottawa, March 1947; First Secretary, Paris, September 1951; attended courses at NATO Defence College, Paris, November 1951; Counsellor, Delegation to NAC and OEEC, Paris, June 1952; Adviser to the Canadian Commissioners, ISC, Indochina, September 1954; Ottawa, March 1955; Asst. USSEA and Legal Adviser, December 1956. Deputy USSEA, July 1960; Undersecretary of State for External Affairs, May 1964. Member of the International Law Commission, 1961. Member of the Board of Governors of the National Film Board. Author of "Le Ministère des Affaires Extérieures"; "Premières Armes", "Embruns" and "Le Diplomate Canadien". Married (Anita Comtois). Two children.

Langley, James Coningsby, Born in Ottawa on May 1, 1922. (BA (Oxford Univ., 1949); MA (Univ. of Toronto, 1950). Joined British Army 1941 (Pte); served in United Kingdom, India; discharged 1946 (Capt). Instructor, Univ. of Toronto, 1949-50. Joined External Affairs as FSO 1, June 1950; Second Secretary, Brussels, October 1952; Adviser to the Canadian Commissioners, ISC, Indochina, November 1955; Ottawa, February 1957; First Secretary, Washington, May 1959; Counsellor, July 1960; Appointed Permanent Representative of Canada to OECD, Paris, February 1962. Ottawa, January 1965. Appointed Assistant Undersecretary of State for External Affairs July 18, 1966. Married (Stephanie King).

Miller, David Miles, Born in Sprinagar, Kashmir, on April 6, 1932, B.Com, LL.B (University of British Columbia, 1957, 1958). Called to Bar of British Columbia, 1959; practised law, Messrs. Campney, Owen and Murphy, Vancouver. Joined External Affairs as FSO 1, August 1959; Third Secretary, Pretoria, June 1961; Second Secretary, October 1962; Chargé d'Affaires a.i., September 1963-August 1964. Ottawa, August 1965. FSO 3. FSO 5 April 1968. Head, Legal Planning Section, Legal Division, External Affairs. Married (Mary Carrick Hincks). One child.

Gignac, Jacques, Born in Shawinigan, Que., on July 24, 1928. BA (Coll. Jean-de-Brébeuf, Montréal, 1949); Th.L, L.Sc.S (Institut Catholique de Paris, 1955, 1957). L. Lettres (Sorbonne 1957), Univ. de Montréal (1957-58); Professor at Coll. Sainte-Marie, Montréal 1958. Joined External Affairs as FSO 1, September 1958; Vice-Consul, Boston, July 1959; Second Secretary, Paris (Embassy), February 1962. Ottawa, September 1965. FSO 5. Head, Cultural Affairs Division, External Affairs, October 1967. Married (Françoise Teisserence). Three children.

Dolgin, Marc Isaac, Born in Winnipeg on March 16, 1940. BA (University of Manitoba 1962-63), B.Comm (Hons) 1964. Joined External Affairs as FSO 1, September 1964. Moscow, May 1966; Ottawa, September 1967. Cultural Affairs Division, External Affairs. FSO 3. Married (Adele Caren Berkowitz).

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, March 12, 1969

The Special Committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

[Translation]

Chairman: Madame, gentlemen, we have the pleasure, this afternoon, of welcoming Mr. Marcel Cadieux and his colleagues from the Department of External Affairs.

Despite his age, Mr. Cadieux is perhaps among the more senior members of this Department and I have no hesitation in stating that he has given long and faithful service to his country.

[English]

The Chairman: I am very pleased indeed to welcome on behalf of the committee, Mr. Marcel Cadieux, the Under-Secretary of State for External Affairs. He is accompanied by Mr. James Langley, Assistant Under-Secretary of State for External Affairs, and Mr. Freeman Tovell, Director General of Personnel Branch, and Mr. David Kirkwood, head of the Office of Economic Affairs.

As usual, Mr. Cadieux will make an opening statement and then the meeting will be open for discussion.

[Translation]

Mr. Marcel Cadieux, Under-Secretary of State for External Affairs: Thank you very much, Mr. Chairman, for your very kind words of welcome. I have, in fact, prepared a statement and, with your permission, I should like to present it.

[English]

We have already pointed out in the departmental brief that although the Department of External Affairs itself does not engage directly in any form of scientific research—here I must explain that scientific is understood in a

rather narrow sense of science in relation to the total sciences, the exact sciences, because in the legal field we certainly engage in some research—the increasing extent to which science and related technological advances have assumed international dimensions, the multiplicity of international organizations concerned with scientific matters, and the complexity of problems created by rapid technological advances, has brought about important changes in traditional methods of approach to the conduct of foreign affairs. This has made this department increasingly aware of the need to keep itself informed on a wide variety of scientific and technical matters, and also to ensure that it is organized that it can rapidly and effectively deal with such problems.

The tremendous strides which have been taken in recent years, not only in space but in advancing knowledge or our own environment, has opened up wide new areas of international concern. A legal framework for preserving the peaceful character of space now exists in the 1967 treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies. The value of the treaty lies in the fact that it points the way toward similar treaties in other areas of even more direct concern to humanity and the need can be foreseen for a series of such treaties dealing with the environment and such matters as the “Ocean Depths”, world pollution, cybernetics, as well as a treaty or treaties governing the use of communications and other types of application satellites, e.g., earth resources, weather, navigation, etc., to ensure that the rights of individual countries are protected and of the maximum benefit to all users.

To cite an example of great current interest, one of the important international areas in which Canada is active is disarmament.

ment. Nearly every disarmament subject has a scientific dimension and the department frequently requires scientific advice in order to evaluate disarmament proposals. As a consequence, it has developed very close working relationships with the Defence Research Board, Atomic Energy of Canada Limited, the Atomic Energy Control Board, and the Department of Energy, Mines and Resources, as well as the Department of National Health and Welfare. The Department, in co-operation with the Director of Chemical and Biological Defence of DRB is participating with other experts in the preparation of a study for the United Nations Secretary-General on the consequences of the use of chemical and biological weapons. This report, when completed, will be referred to the Eighteen-Nation Disarmament Committee, ENDC, which will consider Canadian proposals along with proposals put forward by other countries in this field. In connection with the Comprehensive Test Ban, CTB, there is reason to believe that teleseismology may eventually become a most effective method for surveillance of adherence to a CTB treaty. Proposals for such a treaty are often accompanied by complex technical arguments which only seismologists engaged in this type of research are competent to assess. Nevertheless, our department must be sufficiently well informed on subjects of this kind to be able to determine the value in political terms of proposals put forward by various countries. Canada ranks with Britain and the United States in this field and has made significant contributions to it, both politically and technically, at international meetings. Through the Department of National Health and Welfare, Canada also monitors atmospheric radiation levels and thus assists in the surveillance of the Partial Test Ban.

On the question of nuclear weapons and technology, Canada has taken an active part in the preparation of a recent study for the United Nations Secretary-General on the effects of the possible use of nuclear weapons. This study was related to the Non-Proliferation Treaty, during the negotiation of which the Department frequently called upon the advice of the AECL and the AECB in connection with safeguards provisions and peaceful nuclear explosive services. Canadian interest in disarmament has also been reflected in the very active role taken by Canada in support of measures placed before the United Nations.

Canada is also active in many other areas of United Nations activity related to scientific and technological developments, particularly those aimed at taking greater advantage of the earth's resources for the benefit of mankind at large. Much of Canada's activity has been within scientific programmes sponsored by UNESCO. As a country surrounded on three sides by water, Canada has, quite naturally, shown particular interest in programmes initiated by UNESCO for the study of hydrology and oceanography. In keeping with its broad responsibility for advancing Canadian interests, the Department has been instrumental in securing Canadian representation on the Co-ordinating Council of the International Hydrological Decade, and in the secondment of a Canadian representative, Dr. J. Fulton of the Science Secretariat, to participate in the preparatory work for the Mid-decade Conference. The Canadian Committee on Oceanography, although primarily interested in Canadian programs, has been active in some aspects of UNESCO's oceanographic activities. Dr. J. R. Tully of the Fisheries Research Board is Chairman of the Working Committee for the Integrated Global Oceans Station System which is one of the major projects undertaken by the Inter-Governmental Oceanographic Commission. In other areas of interest to UNESCO, a Canadian delegation attended the Biosphere Conference in September of 1968 and a Canadian, Dr. J. M. Harrison, A.D.M., Research, Department of Energy, Mines and Resources, is President of the International Council of Scientific Unions which is UNESCO's chief adviser on scientific matters. While the department does not participate directly in the purely scientific work of these organizations, it follows closely the proceedings of each and is active in the decision-making process which determines the organizations on which Canada is represented as well as in the selection of personnel to serve in them.

In another area of interest to our Department which promises to be of increasing importance as time goes on, Canada has participated actively in matters relating to the development of satellite technology and is at this moment directly involved in negotiations for the working out of definitive arrangements for the Interim Communications Satellite Corporation, INTELSAT. Canada has also participated actively in a working group and prepared a joint paper with Sweden on the implications, political and otherwise, of direct

broadcasting from satellites, a development which can be expected to take place within the very near future. The department has also been involved in negotiations in connection with the Government's plans to launch a domestic telecommunications satellite in 1971.

Scientific and technological advances have also given rise to new problems in international law on which this department provides advice and assistance. The recognition of the potential value of the seabed as a source of minerals, food and other resources has involved the department deeply in international discussions and negotiations. Similarly, the development of satellite communications can be expected to raise a number of very complex problems regarding national rights and sovereign jurisdiction as well as difficult questions concerning re-broadcasting, recording and author's rights. Although the department does not necessarily take a leading role in each of the foregoing activities, it has a definite interest in all of them and consequently it endeavours to keep itself well informed on the technical aspects of each problem in order that its advice, when required, will be cogent and constructive.

In keeping with its general interest in economic developments, the department some time ago recognized the role of science as a determinant of economic growth. This has found direct expression within the Organization for Economic Cooperation and Development, OECD, of which Canada was a founding member. The department has had a science counsellor on the staff of its mission to the OECD who represents Canada on the OECD scientific committees, namely, the Committee for Research Cooperation, CRC, the Committee on Science Policy, CSP, and the Committee on Scientific and Technical Personnel, CSTP. In carrying out his functions, the science counsellor, through the department, has particularly close working relations with the National Research Council, the Science Secretariat of the Privy Council, and the Department of Manpower and Immigration. The department also coordinates exchanges with other science-based departments and contributes budgetary support to certain scientific programs sponsored by the OECD. Since joining the OECD, the department has participated with other departments and agencies in three major OECD meetings on science held at the ministerial level.

In the field of defence research, Canada has taken an active part in NATO defence science

organizations for many years, as a consequence of which numerous productive contacts have been developed and sustained. Scientific information is exchanged between the Defence Research Board and a number of European countries including the Netherlands, Norway, France, Greece, West Germany and Denmark. Cooperation with Britain has been particularly close.

The department's interest is, however, by no means limited to broadly based international organizations, but is pursued wherever there is a definable Canadian interest. For example, last year Canada joined the International Council for the Exploration of the Sea, whose headquarters are in Copenhagen, after having had observer status for a number of years. This Council, that is, the ICES, apart from Canada and Iceland, is entirely European in membership and is a promising forum for cooperation between Canadian and European oceanographers. With regard to meteorology, the free exchange of meteorological intelligence among the nations of the world, with the possible exception of postal services, is the outstanding example of continuing effective and efficient international cooperation. Canada, as a member of the World Meteorological Organization, participates with all countries of Europe in this Organization. The department has also been active in encouraging cooperation with European countries, bilateral basis with other countries. Scientific exchanges form an important part of our cultural agreements with France and the Soviet Union and the Department also assisted in the conclusion of a scientific exchange agreement with Brazil last year. The department is currently assessing the prospects for the conclusion of scientific agreements with other countries where the level of scientific advancement is such that it would be in the general interest of improving bilateral relations to recommend that scientific exchanges be placed on a more formal basis. In order to ensure that such exchanges, as well as the many informal exchanges which now take place on an agency-to-agency basis are facilitated, the department foresees a need during the next few years for increasing the number of scientific attachés at its posts abroad.

One question which the Department must continuously ask itself is whether or not its present arrangements are adequate to meet

the demands placed upon it for coordinating Canadian external policy in this most difficult and complex field. To this end, the department has an active concern in the work of the Senate Committee on Science Policy and any other initiative aimed at coordination and direction of science policy within the Government. At the same time, the department must carefully examine its own structure to ensure that it is organized effectively to serve the Canadian scientific bilaterally and multilaterally, on numerous other scientific projects related to resources both renewable and non-renewable, forestry, health sciences, northern research, and the exchange of scientific and technical information. The National Research Council in cooperation with the Department over a period of years has concluded a number of bilateral agency-to-agency agreements, not only with European countries, but with other countries where sufficient interest has developed.

Bilaterally, because of its close proximity and a very great degree of cooperation between Canadian and American industry in the defence field and in many other areas, it is quite natural that scientific cooperation with the United States is proportionately greater than with other countries. However, science knows no international boundaries and the level of Canadian scientific cooperation with countries other than the United States is nevertheless impressive. As has been noted elsewhere, the Department of External Affairs is responsible for the negotiation of treaties with governments and has a role in the formulation of Canadian foreign policy. In the atomic energy field, this has been expressed in formal agreements covering atomic energy safeguards with EURATOM, West Germany, Spain, Sweden, Switzerland and Britain. In addition, Atomic Energy of Canada Limited has inter-agency agreements with national atomic energy agencies in Italy, the Soviet Union, Britain and France. In space, Canada has cooperated with Britain, France and Norway, as well as with the United States, in the Alouette-ISIS Satellite Programme to investigate the ionosphere. Under informal arrangements with West Germany, Canada has recently launched rockets containing experiments for the peaceful exploration of space by West Germany scientific institutes. The Canadian sounding rocket programme has also carried experiments for Swedish and British scientists. In connection

with the proposed launching of a Canadian domestic communications satellite, Canada has within the past few months sent two technical missions to Europe to look into the possibility of increased cooperation in the development of satellite technology. The initial results of these missions have indicated that there are many areas where Canada and European countries could cooperate; in particular, the European Space Organization in which Canada participates as an observer. The opportunities which may present themselves in this particular field are being closely examined at the moment, together with the possibilities of greater bilateral cooperation between Canada and France and Germany with respect to the joint Symphonie Project.

During recent months, a good deal of attention has been paid to the broadening of scientific exchanges on a community. As explained in the brief presented to the committee, scientific liaison and/or negotiation between the official scientific community in Canada and their counterparts in other countries and international organizations has been related to the activities and concerns of various units of the department. While this system has worked well to date, the department, as part of its continuing examination of its operational techniques, is giving some thought to the possible advantages of setting up an office or division which would have the responsibility for departmental co-ordination of scientific and technological aspects of Canada's external interests. Such a new division or office would be able to assist other departments and agencies in avoiding duplication of Canada's efforts in various fields of interest and help them to take advantage of expertise in one area for application to another. It would also provide science-based departments with a central focus within the Department of External Affairs to which their enquiries and communications might be directed. This is a matter of immediate concern to the department and a subject which is now being actively reviewed. Should our further examination indicate that re-organization along these lines would be fruitful, a recommendation to this effect would be put forward for approval.

While it is recognized that the interests of the committee are directed primarily toward scientific matters, it would perhaps not be out of order to add a word about the use of technological devices in the department's operations. The department already makes use of

very advanced electronic communications equipment for advancing its ability to provide missions and delegations with information and instructions, and to ensure that the views and analyses of officers posted abroad become available to the department by the most rapid and secure means possible. However, there are a number of areas, particularly in the administrative field, where the department believes it can improve its operations. The application of computer technology has already taken place in the financial management area. It is intended to apply as rapidly as possible similar techniques to the maintenance of personnel and property records. The advantages of systems of this kind can readily be seen when related to a department with large quantities of equipment and machinery as well as furnishings and other properties at many points overseas.

The department has also been studying with increasing interest the subject of information storage. This relates to the use of computer techniques and technologies for the filing of information which would tend to provide us with relevant background material to assist in the analysis of political developments and thus to enable us to attempt to forecast with a greater degree of accuracy possible trends in international affairs. Experiments along these lines have already been carried out in other countries and we are at present gathering information with a view to determining to what degree they might be used in Canada. This would indeed be a complex system involving the transmission, selective dissemination, storage, retrieval and final disposition of substantive information on international developments. In my opinion, if such techniques can be applied to the conduct of foreign relations, they should be used and certainly I consider them to be worthy of serious investigation.

Thank you, Mr. Chairman.

The Chairman: Merci, monsieur Cadieux. Senator Aird will initiate our discussion,

Senator Aird: Mr. Cadieux, thank you very much for your presentation. It was received by the members of the committee only half an hour ago, and I really have not had time in which to give it consideration, but, read together with the brief which we received last week, I must say that it goes a long way towards answering some of the questions that occurred to me upon my reading of the original brief.

Early on in the first brief it was stated, I believe, that, in effect, your department had no science policy as such, and you relied upon other departments for information and advice, et cetera.

What concerned me, sir, was that there seemed to be lacking in the first paper an attitude towards science, and I note from your second brief, particularly beginning at page 11 and following through to the end, that you seem to indicate there is, if I may say so, an awareness of the contribution that scientific research can and should play. So, after reading the two documents together, I am pleased with what I discern to be your attitude.

Going back, however, to the original brief, it seems to me that its emphasis lay on people; and of all the departments or agencies of government, External Affairs depends primarily on people. It does not matter whether you are in Brussels or in Kuala Lumpur, if you meet a Canadian representative then he is Canada to the people of that country. I would like to divide my questioning, if I may, as between the people abroad and the people at home, and, as a supplement to that, the research facilities available to the people abroad and the research facilities available to the people at home.

First, turning to page 9 of the original brief, under Item 15, Mr. Cadieux—and I trust you have it before you—I was concerned when I looked to see the current personnel establishment, and people on strength by category of personnel, not so much to find that London was vacant at the moment, because no doubt it will be filled, but what about, as you point out in your second brief, Sweden; what about Japan, what about West Germany, and, possibly, what about Switzerland? It seems to me, sir, that these are countries that excel in some specific scientific endeavour. It would seem to me to be just as logical, for instance, to have a man in Sweden, given today's circumstances, as it would be to have a man in some other countries of the world. I think that Canada could very well learn from the centres where there is a genesis and a new thinking. Therefore, my first question—and it is partially answered perhaps, but perhaps you might care to amplify it—is: Do you have specific intentions as related to specific countries? I should be

particularly interested in knowing whether or not you have any ideas on representation in Moscow.

Mr. Cadieux: In these matters our department is one member of a community that makes recommendations to the Government on priorities as to where personnel should be assigned. We are in touch with the Science Secretariat, the National Research Council and various other agencies. The recommendations are based on a variety of points of view as to where the interest might be in the country concerned. This is from the point of view of the consumer, so to speak.

This has to be reconciled with the allocation of resources, and here different processes are brought into play; there are other priorities that impinge on the resources, and this has to be balanced against these requirements. The end process is the number of posts that can be allocated for purposes of scientific liaison in any given year. Last year we were able to have an allocation of four. In future years we hope it will be possible to have more. Certainly in light of the discussion in this committee and the growing awareness of the importance of science in the development of the country, the development of certain countries and their relevance in terms of significance for Canada, it may be possible to get a larger establishment. At this point I hope that some of the countries you mentioned will be included in the list of those for which appointments can be made.

Senator Aird: Thank you. Would you care to answer perhaps a little more specifically about the U.S.S.R.? The reason for my question relates to testimony we had from the National Research Council on October 23, 1968. It is quite a full document, and in Appendix I, at page 1 they list International Exchanges. The first relates to formal agreements with organizations outside Canada. They say:

- (i) Since 1959, the National Research Council has had an agreement with Soviet Academy of Sciences providing for the exchange of (a) three senior scientists and (b) seven research workers each year. A copy of the current agreement is attached (Attachment 1). Also attached is a list of Canadian scientists who have visited the U.S.S.R. under the agreement (Attachment 2).

It is true this is ten years old. Would you comment on the amount of liaison presently

between you and the N.R.C. as it relates to an exchange of this kind? Is it working?

Mr. Cadieux: I think it is. I think we have good liaison with the N.R.C. This applies not only in relation to the U.S.S.R. but to any other country in the world. I expect that we will be developing even closer liaison in the future, because this problem is increasing in importance. There is a plan that I have discussed with the director of the council whereby a representative of the Department of External Affairs would sit in on their council subcommittee meetings concerned with their international relations to comment, as required and at their request, on the international implications of whatever problems they wanted to discuss with him. I think that will mean a very great advance in the liaison between us.

In the past I have always found that our people in the working level have been very easily in touch. They have attended the meetings as required, and they have been in touch over the telephone and the contacts have been continuing and easy. My impression is quite satisfactory.

Senator Aird: If I might turn then to the people at home. Once again, in your presentation today you indicated that there is a new awareness, an awareness of the necessary back-up here in Ottawa. As I gather from the material, perhaps there is some kind of a scientific division, a scientific adviser who, I presume, would be responsible to you. One of the things that has concerned us in committee, Mr. Cadieux, is the liaison and the reporting. Should a scientist report to a scientist or should he report to a member of the Department of External Affairs? Would it be your view that the suggestion that I understood you to make in your submission is about to come to pass?

Mr. Cadieux: I think the problem has two or three levels or dimensions. In places where you have a scientific adviser there is his relations with the head of mission. How does he gear with the political head of mission? This is the first dimension and here I think a good deal depends on personality, but generally it is a matter of common sense that the scientific man, just like the military man or the commercial man must have some rapport with the man who represents the totality of

the Canadian Government, the head of mission. There has to be an understanding as to what the broad priorities and areas are.

On the other hand, there is another requirement and that is that the scientific representative must meet the technical requirements of his department. There is in some cases a need for reconciling what may be the broad political objective that the head of mission may have in mind as well as the more urgent, more technical and more pointed needs of his own specialized department. It is more technical than real.

With a minimum of good will I have found that in the various posts and various fields this has been worked out so that while in theory you could have conflicts, here in practice, given the minimum of good will and common sense this is workable. This is one area where I think you have a problem of the scientific man reporting, in effect, to a chief of mission, who normally might not himself be a scientist in the technical sense of the word. This is one area.

The second area is at the departmental headquarters. Normally the head of the foreign office, whether myself or any successor, is again not necessarily a scientist in the narrow sense of the word. Whether you had in the Department of External Affairs a division headed by a scientist or a general officer, one has to take into account the specific interest of the Department of External Affairs, that it is not to judge the scientists, and not to pass judgment on their views as to what the priority trends and requirements are.

However, in this field as in other fields, to relate what may be the emerging scientific requirements in the world community with the political requirements of the country or of the world community, is essentially a political job.

Now, what you want to have in this position in the Department of External Affairs is someone who is capable of communicating with people who are immersed more than he is in the substance of scientific work, but this is not particular to the scientific field, because you only have four Assistant Under-Secretaries or five who are covering a great variety of divisions. You have people responsible for economists who may not be economists themselves. You may also have people who are co-ordinating the work of specialists in cul-

tural relations who may not themselves be cultural relations experts. What they must have is an appreciation for the political implications of cultural work. This is the essence and I think it is possible also in the scientific field, but where it is very essential that you should have a meeting of minds is both in the type of people who are concerned with scientific work in External Affairs and the people who supervise them as well as an ability to communicate on the side of the supervisor, an ability to appreciate what the scientific man is doing who is working in External Affairs, and some kind of ability to appreciate the political side of things.

Otherwise, there will be a very serious communication problem.

This is so much so that I think it is not inconceivable that you could have a scientist, who for a while would take an interest in the stream of political affairs and divide his attentions. He could be not only a scientist but perform usefully as a supervising officer in the field of foreign affairs. His job is to marry scientific development and policy in international affairs with the general stream of foreign policy, or you could work at it the other way. This is the second level.

First the missions, then the department and then you have Government. Here you get into the situation where the ultimate decisions are made by the Treasury Board and by the Cabinet committees and Government. Again you may have scientific advisers, but ultimately the decisions are not made by scientists; they are made by people elected by the citizens in the country to decide what are the national priorities. Again, there must be an understanding of what science can do for the country and in terms of its projection abroad, what those abroad can do for Canada and an understanding of what the dimensions are. This is where perhaps the quality of the advice that is given to them and the ability of the people to interpret these things for those who make these decisions, may be a vital link and again the machinery available to the Government to put all these things together and to put into perspective may be an essential truth in the process. I think at the other end that there has to be ultimately a kind of admixture of the expert and the generalist to determine whether it will be possible to arrive at a balance.

Senator Aird: Thank you very much for your very full answer, because it enables me

to perhaps make a simple question. I think you have made the case very clearly that your department should have perhaps the initiative in the recruitment of these scientists who become politicians and advisers, be it economics, science or whatever.

At the present time, as I read your brief, this initiative lies with the Science Secretariat. I am slightly confused as to the role of the NRC as an adviser or as a source, but it seems to me that your point is very well made and I would like to hear you either confirm or deny my strong feeling that the initiative should lie with your department.

Mr. Cadieux: At the moment there are not many, as you pointed out. As time goes on and science becomes more important in our national and international life I can well see that in the recruitment of people who will play a role in policy formulation in the Department of External Affairs, that some background in science may become a requirement or that at some stage in their career an exposure to science in the special sense in which it is used here may become essential if we wish them to perform their co-ordinating role. That I think is one way of approaching it or alternatively, when people are selected, whether by the Science Secretariat or at the invitation of the Science Secretariat by the National Research Council on grounds of their general attitude to community with non-scientific people. It may well be for a period of service with the foreign office that part of the operation will involve a period of training at an institution that will give them the foreign policy background and familiarize them with the broad implications of the various fields in which they will be required to operate. I think it is possible to approach it from both sides. But certainly, as the volume of the operation increases, the techniques will have to be refined, and whoever deals with it will have to develop an awareness of the other side, because it is the ability to communicate which makes it possible to integrate. Otherwise, where there is no integration there is no understanding on the other side of what this is all about. It is no good if you have foreign service officers who do not and who cannot appreciate the implications of this great big scientific revolution that is going on. But then again, it is no good if the scientists on their side are incapable of securing an understanding on the part of political leaders and their advisers, or what this

means in terms of community building and interchanges amongst people and what the effect of this can be at the political level in terms of exchanges of persons and things like that.

The Chairman: At the moment do you have a veto on the suggestions or nominations made by the Science Secretariat?

Mr. Cadieux: Like many things in life, this I have not dealt with in terms of veto or in black and white. I am sure that what would happen is that we would not wish to be arbitrary and lending departments would not wish to impose or to force us to accept someone that appeared to be unsuitable. I think that the way it works is that, if someone is suggested and if he seems to have the qualifications required to do the job, then we have no reason to object. But, if it seemed that, either because of a file review or because of his reputation, or in the light of his experience, that a man did not adapt well to life abroad, then I think our representations would certainly be entertained by the agencies responsible. But here again, I think it works on a basis of rather more informal communications. In theory, I think that certainly the Head of Mission abroad and our department would, I would think, have the final say, that is, for good reason. If it came down to whether a man would or would not be posted at a certain mission it is not within my experience that either in this field or any other that it has happened, because the agencies that offer or suggest personnel to be posted abroad have screened them and they act responsibly in this matter. They well realize that the people they send abroad will, in their various fields, be their ambassadors in that field abroad, they will also be the ambassadors of the country and they are usually very anxious to put their best foot forward.

Senator Aird: Mr. Chairman, if I might put two short questions, to finish off. I think they are probably answered ahead of time. I am gratified to see what I consider to be an attitude, in the second paper.

My first question relates to the availability of material, your library, your inventory, and so on, in the department, as it relates to people going to new postings: what is the extent of research papers? Are you satisfied with the extent of the research availability?

To give you an example, now that we have the consideration of the proposed recognition

of Red China, is your department adequately stocked with research material, to enable a young man sent there to have as fully as possible educated himself, before departure?

Mr. Cadieux: Well, the short answer is no. Ideally, we would like to train our people for a long period before we post them to a country. Ideally, we would like them to know the language. Ideally, we would like them to read the good books, to know the people who are knowledgeable about the country.

Senator Aird: And the bad books, too, sir?

The Chairman: In that sense, "bad" may be covered by "good".

Senator Grosart: Mr. Mau's book.

Mr. Cadieux: In real life, you sometimes have to meet operational requirements that are urgent, and you have to compromise. It is not always possible to do this and this is one problem. You may have a young officer at a post who becomes very ill and who has to be returned to Canada, when you expected that he would stay there for two more years. You have to select somebody in a hurry to replace him, so you do not have two years to train somebody. You do not have such a supply in a relatively small department like our own, to be able to stack people just in case. So you have to point the finger at somebody and he has to go, and this may happen fairly often.

This is one of the risks of the profession. We have to do what is less than perfect. Ideally, if we had the time and if we had the resources, we certainly would wish to provide that training.

Another thing that is important is that there is an element of training in the job also. If you have sufficient staff on a mission, the best place where he can learn, let us say, about a country like Chile, is in Chile. If you send him there, he will learn the language with the particular accent that may have developed in Chile and that is noticeable as the accent of the people of Chile, the accent of the language that is spoken there. Also, he learns about the literature, he learns about the poetry and he learns all about the country. So, if you can expose him there, without engaging him too much or too quickly, operationally, this is a very good form of training, too.

However, we tend to run lean, because we want to economize on resources, and it is not

always possible to keep the people on training for very long and we are caught here and there between conflicting requirements. We have to make as good and as quick use as we can of our human resources and in the course of operations, particularly when they are young, if they are keen, they will take some of their leisure time to inform themselves about the folklore, to read books, and so on. We find that, even though they do not spend a great deal of time on what is formally called training and they are engaged in operations sometimes very quickly after they get there, their natural keenness to learn about the country where they are, leads them in a short time to find out a great deal about it, to read the books and to be quite knowledgeable.

This is not possible in countries which have a language or a culture that may be more esoteric. If it is an Arabic country, or the Soviet Union or if it is a country like Japan, then this system of quick posting and this sort of assignment to operations does not work. Then the officer must really be given time to learn and must be given formal training. In countries that have a culture which is not too far removed from our own, or in countries that even have our own language as an official language, like French, like English or Spanish or Italian, then the amount of time that an officer needs to move into operations and perform satisfactorily does not have to be as great.

I come back to your point, ideally what we would want to have, if we could, is to have enough people and to be able to select our people sufficiently in advance so that they would have time to prepare themselves in a more leisurely fashion by reading the best books, by meeting the people, by learning the language, by being more knowledgeable, more expert about the country, than we can afford to do now.

The Chairman: Are you satisfied with what the Canadian universities are doing in that field in order to prepare more specialized people for you?

Mr. Cadieux: In a way, no; but I am wondering whether it is fair to expect universities to gear themselves to that, because the market may not be large enough. We do not send enough officers to any one given area to expect one, let alone many universities to provide facilities, to train these people and I

do not know any other institutions in Canada, apart from our own department, where there are enough people to be trained to make it worthwhile for universities to devote their resources and to create the training facilities.

I know that some years ago the Association of Colleges and Universities looked into this and certainly found that the facilities were not adequate. Perhaps for the sake of learning, for the sake of the advancement of learning, it would be desirable that there should be more than we are doing now. But if in terms of our department, before we sent somebody to a country, say, the Middle East, were we able to send him to an institution in Canada where he could learn the language and the history, that would be all very well, but I do not think that our own requirements are such that we could justify the expenditure. It will always be more economical for us to send the man to the post and tell him he is not to work there, that he is not really available for operations for approximately a year and a half but that he must study hard and use the local institutions. That way is much less expensive.

Now, whether, for the country, you engage in a very different set of considerations, I do know, but as a department it would be difficult for us to justify or encourage universities to do that just for us.

In other respects, when it is a matter of consulting the members of the academic community, as we have been doing in the current review of foreign policies, then that is the course we adopt. It is a delight, really, to be able to meet people who have examined in depth the subjects and to be able to exchange views with them. This was the case in Toronto over the weekend with respect to Latin America. There is no doubt that over recent years there has been, on the part of people engaged in academic life, and also businessmen and newspapermen, a considerable increase in the knowledge about Latin America—an increase to the point where there can be a very fruitful exchange with these people. But I doubt whether we could pull this together into an institution and then dispense specialized knowledge to help officers take posts; I doubt if we have reached that stage yet.

Senator Aird: It seems to me, Mr. Cadieux, that, particularly in your department, communications are of vital and dominant

interest, which is appropriate in view of the fact that in today's technology we have almost instant communication with all parts of the world. I was happy to look through a book entitled *The Year 2018*, with which I am sure you are familiar. I was particularly interested in one chapter in the book dealing with communications. It is breath-taking to wonder what the world is going to be like at that time. It seems to me, and I presume it is the case, that your department is extremely aware of the importance of communications and instant communications, and it is my strong belief that any research or any research oriented study should be in this field, and I think that is really more of a comment than a question, Mr. Chairman. Thank you.

Senator Grosart: Mr. Cadieux, like Senator Aird, I was very happy to get the second part of the submission. It answers some of the questions I was going to ask, because when I looked over the establishment of the department I was amazed to discover that there was not a Division of Scientific Affairs. I know you have had for some time a Division of Cultural Affairs, and I see Mr. Gignac here. I think at the moment Mr. Gignac probably has more attachés abroad than you have in science. I do not object to that, as Mr. Gignac well knows, because I have a keen interest in that field.

I am particularly interested in the mechanism of getting science into our foreign affairs decisions, and I am aware, of course, that we are all just beginning to catch up with this scientific revolution. I think it is probably true to say that all our departments are a bit behind in that respect. Now, I take it you are going to establish a new division. I know you have not said that that is going to take place, but you have said that you are looking at it you give the impression that you are examining whether or not the present arrangements are adequate to meet the demand placed on the information input into Canadian external policy in this most difficult and complex field. To take an example of an area where there seems to be in Canada a rather large deficiency gap, I would like to ask you some questions about the input of scientific, particularly technological, information into Canada through the Department of External Affairs.

Japan has, as we know a network of persons and offices supplemented by missions

which they send abroad. I would think the Canadian situation is to some extent comparable to that of the Japanese situation in that we cannot expect in Canada to initiate a very large share of the world's scientific development. Is there anything contemplated in this "new look" that you have indicated that would somehow step up this input?

Mr. Cadieux: My answer to this, I think, is really twofold. First, the scientific community will have to be organized within Canada and some decisions will have to be made before this can be projected abroad. In a way, our department is not the initiator in this. This is the first point. You know, we in external affairs reflect the requirements of the scientific community in this field.

The second point is that the policy review in regard to the Pacific is only in contemplation; it has not yet started. I think this is part of our review of our relations with the Pacific countries. Then here is the question of what we would do in that area and in particular in relation to Japan and the examples we will be getting from Japan will be looked at. You know, in our relations with Europe, the possibility of exchanges in the scientific field and what we can do in this area have been examined very carefully and some recommendations have been made.

Senator Grosart: One of the reasons I raise this question is that the Economic Council, in its Fifth Report, tells us, on page 55, that we have been, historically, heavily dependent upon technology originating abroad, and it says that it is essential to seek to maintain efficient arrangements for monitoring and screening new scientific and technical developments taking place in other countries and to ensure that means are available for disseminating information available to sectors of our society which can be effectively used.

At the moment I think we are doing practically nothing in that area, is that correct?

Mr. Cadieux: No. Our missions keep scanning this and the scientific community in Canada, even though it is not represented by an attaché in Japan, is not, I would say, unaware of what happens in Japan. In fact, they certainly receive the scientific magazines and scientific communications coming from Japan, and they are aware of what is going on there. I mean there are congresses and there is an exchange of persons. We visit

there and the Japanese scientists come here. There is a good deal going on. One thing that may be missing—and we may yet fill that gap and we make this recommendation to the Government—may be the appointment of a special team from the scientific community to be placed in Japan. I specify Japan, if that is the place where you want them to be. But, on the other hand, the fact that such a team has not been appointed does not mean that at the moment nothing is happening.

Now, I am not a scientist and I am not in a scientific department. Just how much they get and through what means I am not able to tell you, but my suspicion is that they get a good deal. It seems to me unthinkable that Canadian scientists are unaware of what is going on in the scientific world, including the part that is Japan.

Senator Grosart: The Economic Council does seem to suggest there is a gap and that something should be done, and I suggest that maybe the Department of External Affairs should be doing it. For example, in Japan their present target is 900,000 abstractions per year from foreign scientific information. Now I think it is obvious that we are not anything close to that. It seems that they do take their responsibilities or some of their responsibilities more seriously. In their Ministry of Foreign Affairs they have a number of agencies; the Overseas Technical Co-operation Agency, the Technical Training Centres, the Development Survey Teams and the Economic Co-operation Bureau. They also have their science attachés. I gather they have eight now which is rather more than the number we have but it seems to me that if Treasury Board is willing we may be stepping up ours.

Mr. Cadieux: We have four, and the way it works is this; the scientific community gets together and they have to advise us in External affairs as to where the priorities lie. As diplomats we are not well placed to say that the hottest thing happening in the scientific world is in Germany rather than in Japan. Here we need to get information and answers from the various scientific agencies. Naturally there will be some discussion, compromise and priorities which may have to be set where political considerations come in. Where many agencies are involved there may have to be a consensus developed to decide where we can go. We cannot afford all these things at the same time in all these places. That is

the difficulty we face. But my impression is that these publications must be exchanged between national libraries, particularly the specialized ones. So there must be a good deal of knowledge available.

Senator Grosart: But if somebody does not take the responsibility as it has been taken in Japan and in other countries we are not going to get to this level of excellence which I suggest we need. The Japanese, for example, have had as many as 30 people abroad connected with their science information centre. They do nothing but look at technological developments. The OECD report on Japan places a lot of credit for their technological development on this very factor. Some people say theirs is an imitative economy, but my view is that the Japanese have been clever enough to convince the rest of the world that it is an innovative economy. You also mentioned that it could well be that we must wait for a consensus of the scientific community, but I suggest to you that if that is the case you will wait forever.

Mr. Cadieux: Each year when we develop our estimates we consult the scientific agencies of the government because we know we have to come to some kind of agreement as to what we put up in our establishment. This is where discussion comes in because there must be some kind of decision made. If all the scientific agencies agreed that the order is Japan, Germany and Sweden, then my job is easy. I put that on the list and say "this is the program" and obviously it will be like that. It may well be that in the end I will have to make a decision in going to Treasury Board, because this is on the establishment of the Department of External Affairs. Personally I prefer to go along with the agreement of the agencies when I get it. But it must be remembered that this is a governmental decision as to how much of our national resources can be invested in this kind of arrangement because at this point it becomes government policy and requires government decision.

Senator Grosart: There seems to be some evidence that there has not been this full degree of integration. Take for example the case of Brazil and the National Research Council. There seems to have been some conflict there. Is that so? I am referring now to the agreement between the National Research Council and its counterpart in Brazil.

Mr. Cadieux: This was very satisfactory and it has worked very well.

Senator Grosart: But why Brazil?

Mr. Cadieux: Because I think Brazil seems to be economically, industrially and scientifically at a point where such exchanges seem likely to be fruitful, but this is done for reasons which I as a diplomat am not in a position to judge. I think the scientists of the National Research Council would be able to tell you why. The only answer that I as a foreign service officer can give you is that when the scientists come to us and say they want to make an agreement with Brazil because it will be good for us and it will be good for Brazil and I look and see that there is no objection, then that is our contribution.

Senator Grosart: That is really the crux of my objection to the present system. I don't think it is necessary to be a scientist to guess that the National Research Council Agreement with Brazil was an ad hoc arrangement and that circumstances arose where maybe personalities were involved and so on. My suggestion is that the Department of External Affairs should ask "why do we have a scientific agreement with Brazil instead of with somebody else?"

Mr. Cadieux: I understand the question, but the problem is different. The problem is that in order to advise the National Research Council on this we have to have and we are having now a general review of our relations with the whole of Latin America, and before we have completed this review we are not really in a position to tell the National Research Council it has to be these countries in priority, and in these fields rather than in that one. So that instead of saying to the National Research Council "there is this thing that you think is good, but don't do anything until your review is complete", we said "if you think this is important for your purposes, do this and later when the review is completed we will have a general picture of the whole thing and there will be advice on cultural relations and there will be obvious indications as to priorities". This is the next stage.

Senator Grosart: And in due course this would apply all around the world?

Mr. Cadieux: We hope so, but this is a long process and must be taken part by part.

The Chairman: If I may interrupt you, Senator Grosart, I have a kind of a supplementary question on this. It seems to me that this exclusive reliance, for instance, on the National Research Council or on scientists primarily interested in science may lead to the creation of a gap because most of the scientists are not too interested in technology. And technology is the kind of thing which you cannot find very often, or least technological innovation is not the kind of thing you can find in scientific journals. You have to be on the spot to detect what is happening and to report it. Also technological innovation is not really a scientific problem; it is really a political and economic problem. If you rely exclusively on the pure scientists to advise you where you should go, and if there is no other basis for decisions as to whether we will have a look-out staff in one country or another, then we may end up by not doing very much in this very important field for the development of Canada.

Mr. Cadieux: The problem is even more general than that. When you look at your relations with a country, you may find that the overall interest may be in promoting cultural relations as opposed to scientific relations. If you are after the two, which will it be? It may be a tricky decision to make. There have to be some priorities, and it may well be in the overall national interest to have one more commercial man, if there were special trading opportunities, and you might not be able to afford for a year or two either a cultural or scientific man, and this is what I think this new instrument, this program budgeting is going to enable the department to develop. They will look at the relations over a period of years, and in particular during the next year, and they will say what are the objectives in that area or in that country, what we hope to achieve and what are the priorities. Hopefully it should be possible to say, "These seem to be the more important objectives, and these seem to be the areas in which it is more important to move." It will call for a degree of interdepartmental co-ordination that even in the best circumstances is not easy to achieve. This is the first kind of problem.

Then you have another kind of problem, one that is more tricky. The National Research Council, in a way, is not under the authority of the Department of External Affairs; they have a special status. I am not

an expert on that, but it is my impression that they enjoy a kind of autonomy, and the way it works is not really by the Department of External Affairs throwing the book at them or trying to be hectoring; we work by consensus and consultation.

In the future, once we have developed these things—and these are not easily measurable among other things, the priorities between various types of activities the country can undertake and the relative urgencies and dividends you can get from investments in manpower or resources—the only thing we will be able to hope to achieve is some kind of understanding for what we are trying to do by discussion with the people in the National Research Council, and if the National Research Council—and I am speaking to your question about an agreement—feel terribly keenly about an agreement with Brazil, it may be impossible for External to say, "You just cannot do that. I do not want you to do it." That will not be realistic it will not be sensible. All we will be able to do will be to say, "Look, perhaps you have overlooked another country where the same effort could be invested, perhaps with greater dividends for the country." But at that point we would have to be very sure of our ground and would have to have indications from their own point of view—this is, what they are responsible for, science—that in that general area we knew better than they did what was good for them.

The Chairman: Why do you not also seek the advice of the Department of Industry, which is mainly interested?

Mr. Cadieux: Under this new system we will be consulting the various agencies concerned, and it may well be our task may not be simplified because we may well find a great diversity of view on the part of agencies, some of which are independent of Government.

Senator Grosart: We have been a little frightened in this committee by the end result of a lot of *ad hoc* decisions in the science field, and all I am really saying is that I would hope that perhaps the new entity or the "new look" that seems to be indicated on page 11 here, would assume responsibility for a plan in the one area I am speaking of, that is this inflow of information. I suggest it cannot be left to *ad hoc* decisions here and there,

because it is so vitally important to Canada that we use what resources we have to know what is going on around the world and to find out what we can use. I suggest that at the moment there is nobody who has been given or has accepted this responsibility.

If I may ask a question arising directly out of other pages of your report, the comment you make at the bottom of page 2 is:

The Department, in co-operation with the Director of Chemical and Biological Defence of DRB is participating with other experts in the preparation of a study for the United Nations Secretary-General on the consequences of the use of chemical and biological weapons.

What is going on there? I did not know that Canada was in this business, and yet we seem to be taking the lead in this.

Mr. Cadieux: Well, I do not know if there is one of my colleagues who is informed on this.

Mr. D. M. Miller, Legal Planning Section, Legal Division, Department of External Affairs: If I may, sir, the study was suggested and agreed to last year in the General Assembly, and it is being done under the auspices of the Secretary-General. Really the people participating in it are participating in a sort of quasi-private capacity; they are experts. I am afraid I cannot recall the name of the man who is the Canadian involved at the moment, but there are some experts working in this field with the Secretary General, and they are responsible for producing a study report on the types of weapons that are possibly being contemplated in the future, the effects of chemical and biological agents that are being used or stockpiled or worked on, in a sort of research sense; and the idea, of course, is to work towards some sort of international agreement, modernizing past agreements such as the Geneva Protocol of 1925, to try to bring more countries under the umbrella of banning the use of these weapons, about which there is very little known. The research has been conducted, if at all, in secret, and it is not easy to find out what other countries have been involved in, both friendly and unfriendly countries. There is a fear and a feeling of uncertainty and, as I have said, this study was set up in the General Assembly last year, and this will be carried forward. The ENDC is very much involved. This is a subject it is turning to and

this study has begun, now it has completed its non-proliferation studies, and it is a completely new area in which the Secretary General is involved, and Canada is participating.

Senator Grosart: So the proposals, the brief says Canada will put forward, will be, I take it, with regard to control and defensive rather than offensive?

Mr. Miller: That is correct.

Senator Grosart: On the same page, sir, there is a reference to the two test ban agreements, the comprehensive and the partial. Recently we had some press reports about concern in Canada over fall-out from the United States test. Would that come under the comprehensive or the partial test ban?

Mr. Miller: It is under what is called the partial test ban treaty. There is no comprehensive. This is a hope, that one day there will be such a comprehensive test ban which will forbid the use and testing of nuclear weapons; nuclear weapons can be tested underground but not in the atmosphere, and if tested underground the radiation should not be allowed to escape into the atmosphere, and the problem about rising radiation levels was connected with the partial test ban.

Senator Grosart: What do we call the non-proliferation treaty? Is not that a comprehensive plan?

Mr. Cadieux: This is another treaty. It concerns the non-transfer of nuclear weapons, and the technique for producing nuclear weapons, to countries that do not have them now.

Senator Grosart: Yes, could creating them, which leads to testing them. The two are very closely tied together. If you are going to be prohibited from making them then you are also prohibited from testing them.

Mr. Cadieux: Yes.

Senator Grosart: That is, if you are prohibited from developing them to the explosion point.

Mr. Cadieux: Yes.

Senator Grosart: What has happened in regard to this protest we made to the United States? Have we had a reply?

Mr. Cadieux: I am sorry, but I am not briefed on that.

Senator Grosart: I was just curious on that point. Do you at the moment have in the department a cadre that you would call a group of scientists?

Mr. Cadieux: Not apart from those that we borrow from the...

The Chairman: I wanted to ask that question as well at some stage...

Senator Grosart: Then, I will leave it.

The Chairman: No, but I would like to have defined more generally what we understand here by "scientific activity". Our terms of reference include not only the physical and the life sciences, but also the social sciences.

Mr. Cadieux: If that is the case, then all of our officers...

The Chairman: But how many of your people would be involved in research activities in this field? Some of your people are involved in cultural activities and also in the field of human relations without doing any research, but...

Mr. Cadieux: There are those who are involved in the development of international law who sit in the Sixth Committee of the General Assembly, or who sit on the various special committees of the United Nations concerned with outer space, the definition of "aggression", or with the elaboration of the principles of the charter—this is a whole area in the legal field. This is the forefront of legal development in terms of international law.

Senator Grosart: How many people would be engaged in that field at the moment?

Mr. Cadieux: A good half dozen, I would say. But, you know, they are at the forefront of knowledge in this area. They have to do the thinking, and they have to keep in touch with the other people in other countries, because there is not much literature available in this field.

Senator Grosart: You have scientists in CIDC, which is a part of your operation, but do you have science advisers within the establishment of the department itself?

Mr. Cadieux: No, we consult the other departments when we have a requirement for scientific advice. If it is a matter that concerns atomic energy then we will call on the people from Atomic Energy of Canada and

ask for their advice. We write to them or phone them. We are in touch with them, and they act as if they are part of the department. The same is true if it is in any other field, whether it is the National Research Council or the Defence Research Board. The people in the department develop fairly close relations over a period of months and years with the people dealing with these subjects in these various scientific agencies.

Senator Grosart: Then, I would hope that when these new developments take place you will have behind you a cadre of scientists because we have been told over and over again that unless you have intramural scientific capability you do not have a capability of digesting the incoming scientific information.

Mr. Cadieux: This is a problem, and I wonder if we can go into this a little deeper, because I am troubled about the implications. One difficulty is that if you take a man who is a scientist and bring him in to foreign policy, and keep him there for 15 or 20 years, at the end of that time how much of a scientist do you still have, and how much of a diplomat? This is one area.

Do you get better service if you get a scientist to move temporarily into External Affairs for a posting, and who is able two or three years later to go back to his outfit, when you replace him by another person. This is one solution.

Another solution is the one we follow now, that of having a centralized unit in the department that has a liaison with the other agencies and branches. They are capable of leading the scientists, but they are essentially political people concerned with foreign policy.

Then, we are always dealing with people who are really full-fledged scientists, and whose credentials cannot be questioned, because they are involved with the scientific agencies of the Government.

There are two or three possible solutions here, and one may be more effective than the others. I know there is this idea that by having a scientist in the Department of External Affairs you somehow increase the hold of science on policy. It may well be it produces that, but it may be better to have diplomats who are sufficiently aware of the importance of science to have day to day liaison with scientists who are good at their job, which is that of developing science. In that way you

get good scientific advice, and the scientific influence will be better. If you get a man who has worked on some particular problem to go with a diplomat to an international conference that is dealing with that problem, then that man is terribly effective because he is dealing with his own field to which he will return afterwards.

It is a choice that has to be made. I am not suggesting it is the best, but it may be the best. What we want here is the most effective answer. I do not think there is any quarrel about whether we should remove scientists from their milieu and have them operate as diplomats. I do not know whether that is a good thing.

Senator Grosart: I agree that there is no easy answer to this, but the suggestion at page 11 does indicate to us that you have this very important matter under active consideration, although, as I said at the beginning, it is surprising to look over your establishment and not find a division of scientific affairs.

I have one final question which arises out of a comment you make at page 7:

In the field of defence research, Canada has taken an active part in NATO defence science organizations for many years...

We have a real problem in this area. I made some notes on it. I will not enter into the matter in detail, but it refers to the counter-mortar radar. We have had a bit of difference in evidence here as to what really happened. The question that comes out of it is: If we develop a weapon in the Defence Research Board or elsewhere particularly for NATO, or if we consider one of the many other activities of, say, the National Research Council that are directed towards Canada's fulfilling some of her international obligations, what role does the department itself play in persuading NATO, or some other organization with which we have a defence agreement, to buy our Canadian development?

Perhaps I could just go over the history of this. In the NRC brief the counter-mortar radar was described as another technological success, and in the DND brief we were told that it materially exceeds the stated military requirements of NATO, and then Dr. Solandt of the Science Council told us:

It is amazing how often these projects are not stopped; they keep on drifting away from their original mission-orientation towards being more broadly-based research in the same field but not really

properly planned ... One minor case in point which I heard of recently is that the National Research Council has been working on a counter-mortar radar since 1944 or 1945 and it was just cancelled... I was in touch with that program many years ago and I know that it would have been better to stop the whole thing many years ago, because first of all interest in the problem had grown less or almost disappeared.

Then Dr. Schneider gave a rebuttal and stated that Dr. Solandt's view was quite in error and misleading:

Apart from the external influences which acted to deny Canadian access to the export market, a number of other factors undoubtedly played a part. These include... the lack of a well defined and closely co-ordinated effort to 'sell' the equipment in foreign markets.

Are we backing up our various scientific agencies in the international field?

The Chairman: Or in the sense in which I think you put your question more precisely perhaps a moment ago, when you asked whether the Department of External Affairs was involved in encouraging our allies to buy our technological innovations.

Senator Grosart: I am asking: is the department prepared to back this up? Is there this co-ordination, real co-ordination?

Mr. Cadieux: The answer again is: in general, yes; in specifics it may not always work the way it would like to. I know for a fact that our ambassador to NATO, for example, is very alive to this and is pushing very hard. I know our ambassadors in specific countries are following this closely. However, one faces competition in these things in some cases, and this is one reason why sometimes it does not succeed. This is an area where competition is very feverish, where the national scientific plan and the national industrial plan are trying to achieve the same results sometimes in the same fields.

Senator Grosart: My question related to subjects in which we lacked a co-ordinated effort.

Mr. Cadieux: The point on co-ordination here is that there is NATO machinery in which these things are being considered, and I know that the NATO delegation is very well aware of the industrial and balance of payments implications for us in these things. I

know our delegation has been working very hard on this whole range of problems. In certain NATO countries certain specific projects have been pursued at a very high level. In some cases, if we have not succeeded it may well be that there has been insufficient co-ordination or something has gone wrong; in other cases the competition may have been too strong; another factor may be that lack of co-ordination may have prevented it, but it is hard to say that because we do not succeed it is necessarily due to lack of co-ordination.

Senator Grosart: Not in all cases, but this was a case in which that statement was made. I again come back to the question of a planned mechanism in areas in which it would seem the Department of External Affairs could be taking the lead.

Senator Hays: On page 3 of your brief you say:

The department could not, therefore, be said to have "a policy toward science" or "science policy", except under the broadest interpretation of these terms. Nevertheless, it makes a significant contribution to the formulation of Canadian scientific policy in relation of its international responsibilities.

I wonder if you could enlarge on this and give us some specific examples, and how you initiate it.

Mr. Cadieux: One specific example that comes to mind is the Swedish item in the United Nations concerning pollution and environment. This is a case at the international level. The Department of External Affairs mobilized the scientific officers of the government here so that we can play a role and associate ourself with the Swedes in this exercise. This is an example of where another country makes a suggestion and we go to scientists to be able to play our political role in the knowledge of the scientific implications.

In the field of disarmament, in the 18-nations committee this whole business of the test that we have been discussing before arises, whether or not tests on the ground could be detected, and a good deal depends on whether the scientists can give an assurance or not. This is an area in which we have been pressing the scientific community to tell us what degree of certainty could be achieved. It is an instance where the pressure comes from the political level on to the scientific community to explore, to push and to refine their instruments, to process their

answers. These are two examples that I can give.

Senator Hays: In this field, are you satisfied with the priority given to this problem?

Mr. Cadieux: These are, we think, particularly important in the case of disarmament, when we complete this treaty on tests; I think this would be important in terms of the move towards disarmament.

In the case of what we call the Swedish item, this whole business of environment, I think a new chapter in international co-operation is opened up. It had seemed that the international community was approaching the problem of regulation of international problems in a sort of isolated way. They dealt with this subject and that subject and there seemed to be no pattern emerging. During the last couple of years, however, the whole thing seems suddenly to have come together. It is very majestic and impressive suddenly to see the world community being conscious of the fact that it is now faced with the task of regulating a vast field going from outer space to the depths of the ocean. This involves the question of responsibility, of good neighbourliness, and it is quite a transposition to the broad new areas of the whole body of law that had been developed for the domestic community.

Lawyers have suddenly become seized of this, and the increased activity of lawyers at the international level is almost extraordinary. In later years, when people write the history of law, I think that this decade and the decade to follow will mark a tremendous advance in all these areas. What is important is that the lawyers have now refined their techniques and in this new field walk hand in hand with scientists, because they cannot move without knowing where outer space begins, where the continental shelf is and where it gets into the ocean depths. No lawyer can advance in these areas without having a scientist at his side.

As can be seen, the requirements of the world community, so that they could live together, compelled lawyers to develop regulations, and in turn the lawyers turned to scientists to get the facts, to get the answers and the impetus. I think it is a very good partnership. This is what I had in mind when referring in the brief to this requirement for organization. I do not want to imply that only

lawyers have become aware of this. Independently I think the scientists have had a feeling of community of interest among themselves, of the world of science having a language of its own, having a solidarity of its own and having interests of its own. What is new, I think, is this feeling of rapport between the lawyer and the scientist, and I think the diplomat, that seems to be emerging, a feeling that the three of them and the various other people concerned in this have a real job to do in the years to come.

Senator Hays: How does this sort of co-operation in your department fare with regard to the Arctic problem today, the jurisdiction there and so on?

Mr. Cadieux: When you are dealing with the Arctic you are dealing with waters and various types of ice conditions. I do not want to be more specific than that because the matter is under review and it depends on, in some cases, the answers the scientists will give you. This is again a good illustration that in order for answers to make sense they must be related to fact, and the scientists are there to make their important contribution.

Senator Hays: In anticipation of what the answers may be, in so far as the scientists are concerned, for instance, who owns the sea and are we doing enough in scientific research to exploit this properly?

Mr. Cadieux: Well, this is a matter of judgment as to how much we are doing. It would be difficult for me to say, but what I have in mind, when you have water you have a certain legal situation, but if the water is frozen all the time how do you distinguish that from earth that is covered with ice? This is possibly a situation that may not be the same as where you have an island which is surrounded with free-flowing water. These are the kinds of situations where the scientists may be very essential in telling the lawyers and the policymakers what the actual physical conditions are. Whether or not there is enough scientific research done in these areas I am unable to say.

Senator Hays: In lieu of this what is the priority in your department now? Has this changed in so far as scientific policy is concerned?

Mr. Cadieux: What I have noticed I think over the past 10 years, and this has become increasingly so, is the growing importance of science as a field and of close liaison with the

scientists. I have found, myself, that the liaison between the External Affairs and the scientific community is something that has worked extremely well, as far as I can judge. The rapport has been good and when they have been asked to give advice they have given it readily and in forms that have been extremely useful for the purposes for which our department exists.

Senator Hays: There has been nothing determined in so far as these jurisdictions are concerned and in so far as the sea and the ocean is concerned.

Mr. Cadieux: Well, the Government I think will give an answer on this very soon. The Prime Minister has said that he will...

Senator Hays: What about the Pacific and the Atlantic? Where is the continental shelf?

The Chairman: There has been a question put to the House of Commons recently.

Mr. Cadieux: I think answers will be given by members of the Government on this subject and in order to observe the discretion that is becoming to a civil servant this is a delicate matter.

Senator Grosart: It is roughly a 200-fathom definition.

Mr. Cadieux: I think the rule under the convention that was signed in 1958 as to where the shelf ends is 200 meters or where it ceases to be exploitable, but the problem there is a little uncertainty and it has created difficulties.

Senator Carter: I have two questions. On page 2 you look into the future and you foresee a need for a number of treaties dealing with a number of matters such as ocean depths, world pollution and you add cybernetics. What do you see in the future of cybernetics that is going to require or might require an international treaty?

Mr. Cadieux: I gave this as a mere example of the kind of things that may develop in the future. It is just for illustration. It may or may not come.

Senator Carter: I thought you knew of some definite things that were taking place and that were going to require an international...

Mr. Cadieux: I was afraid it would be interpreted that way. Perhaps I should have been more clear in my expose. It is the whole

of a range of problems that seem to be, getting suddenly very considerable and things we may not have in the past considered suitable for international regulation may well become so in the future.

The Chairman: They may very well be. For instance, certain computers will become so complicated and so expensive that only the big powers will be able to produce them and perhaps there might develop a need for having some kind of international agreement to provide for the exchange of these.

Mr. Cadieux: I think I can give some examples of the kinds of thing that I have in mind. For instance, under the treaty on non-proliferation there is a commitment on the part of the big powers to conduct peaceful explosions for certain purposes under certain conditions as a service to the world community.

If you are a big power and you have the kind of machine that I think may be available in some years and you get this working you may be able to calculate what will be the supply situation eight or nine months from now and also calculate that the supply will be plentiful. There is no point in keeping your stocks and therefore you might as well sell now quickly and you may be able to undersell a number of countries that do not have this kind of equipment and gain a great advantage over them. This might be an application where commercially you could undercut the poorer countries that do not have the same resources.

Senator Grosart: Are you speaking now of peaceful uses of nuclear energy?

Mr. Cadieux: Yes.

Senator Grosart: Under the non-proliferation treaty—I was going to say if we wanted to build a causeway...

Mr. Cadieux: You could build something and it would be done under supervision and the big powers would undertake to do that.

Senator Grosart: We would have to buy it from one of the atomic powers.

Mr. Cadieux: With prices to be negotiated.

The Chairman: For the moment it is still the causeway.

Senator Carter: Your answer led right into the other question that I had and that was in regard to NATO. You just referred to a huge

nation like the United States with tremendous resources becoming a giant in technology and the rest of the world becoming pygmies. You have NATO. Is Canada taking any initiative in NATO to try to get an integration of the various scientific research programs of the different countries to offset that sort of thing?

Mr. Cadieux: I think some years ago the Italians raised the problem of the famous technological gap and I believe NATO has been involved in the problem ever since. There have been a number of intensive studies as to what could be done to try and regress the balance.

Senator Carter: They cannot regress it alone because these countries are too small. What are they doing in order to come together and work out a co-ordinated program? Is Canada taking any initiative to get the NATO nations to do that?

Mr. Cadieux: Not what you would call an initiative. I think we are concerned with the problem and I think we are examining various steps that can be taken to alleviate it, because this has political implications that are very serious for the alliance. This is related to the problem of investment and it is also related to the problem of brain drain. There are all sorts, such as the problem of migration and various aspects that concern NATO.

Senator Carter: Could you put it the other way. Is there anything being done to eliminate overlapping so the countries in NATO are not spending their money and resources along the same line of research or doing the same thing.

The Chairman: You really want the department to take a very long view once we have eliminated duplication in Canada.

Mr. Cadieux: I think there is some knowledge in NATO on the military side as to what kind of research is done by various countries. How far that goes and how exhaustive that is I would not be too sure. I do not think this extends to the commercial side really to prevent that, to the non-military side, because here you get into industrial and commercial secrets.

Senator Carter: Take the United Kingdom, which has developed a very high level of technology in computers. So far she has not been able to get into the Common Market, so the Common Market could benefit from that. What is to prevent the NATO countries from taking advantage of that if they wanted to?

Mr. Cadieux: Here we get into another range of problems which are political.

Senator Carter: I am referring to what Canada is doing about this. Are we doing nothing to let nature take its course?

Mr. James Coningsby Langley, Assistant Under-Secretary of State for External Affairs: If I might say one word, I think that a fair amount is in fact being done, not only in NATO, senator, but in the Organization For Economic Co-operation and Development. There are three scientific committees—one of which is devoted to the idea of scientific research. Its task really is twofold: it runs a certain number of joint scientific projects and, secondly, it discusses science in the various countries of the Alliance, in an attempt to do just what you have been mentioning, co-ordination and so on.

In addition to that, through the OECD and the other bodies, there are a number of other joint scientific programs, such as, for example, through the European nuclear energy agency and agencies of that kind, which have reactors which are run jointly by a number of countries.

This, as the under-secretary was saying, is far from ideal, but I think it is a very important beginning towards the concept of co-ordination. It has been left, however, to the OECD rather than to NATO, which perhaps has the advantage, because it covers this whole range of civil sciences. You have, for example, the Swiss and the Swedes in there, as well as the Japanese and as well as NATO countries.

So I think it would be fair to say that a fair amount is being done and that, in addition, the whole concept of the role of technology in production and productivity is under study in that same body.

Senator Grosart: What is the status of the suggested UNESCO Treaty on the exchange of scientific information?

Mr. Jacques Gignac, Head, Cultural Affairs Division, Department of External Affairs: What is the question again, please?

Senator Grosart: A couple of years ago there was a good deal of activity in developing a treaty for the exchange of scientific and, I think, cultural information, but the emphasis was on scientific information and UNESCO was to be the sponsor of this.

Mr. Gignac: A multi-lateral treaty?

Senator Grosart: Yes.

Mr. Gignac: I am afraid I am not aware of that.

Senator Grosart: I have a reference to it. I know I have it somewhere, but I do not know where.

The Chairman: Are there any other questions?

Senator Grosart: Excuse me, Mr. Chairman, I have just found it. This is in an OECD report. This has reference to a Japanese report of their Science and Technology Council. It reads:

The report stresses the improvement of mechanisms to make available world scientific and technical literature to Japanese users and also recommended Japanese participation in the proposed UNESCO Treaty for the international exchange of scientific documents.

This is in the 1968 OECD report on Japan.

Mr. Dolgin: There is a series of agreements which are known as the Florence and Beirut Agreements, which cover three things, educational, cultural and science material. This is in effect now, in fact. In regard to this treaty to which you referred, I am not aware of it. These agreements, in a sense, promote the free flow of information and the introduction from country to country of this material. Is that the answer which you wished?

Senator Grosart: It is quite possible that the word "treaty" was not used in the formal sense. This may be the answer to it.

The Chairman: This may be an arrangement.

Senator Grosart: Yes.

Senator Aird: May I ask a supplementary question which goes back to one of Senator Grosart's earlier remarks relating to the extrapolation of scientific documents in Japan and which seemed to be in such volume. Do you, Senator Grosart, have the figures as to the sources? How many of these documents come from the U.S.S.R.? How many come from other countries?

Senator Grosart: If I can remember them, it is rather interesting that 39 per cent of all the abstractions in the Japanese processing of material is of Russian material. About 21 per

cent is German, about 15 per cent is English, and I think 15 per cent would be French and the rest 11. I hope that that adds up to 100. The figures are roughly of that magnitude.

The amazing thing about it is that the Japanese find 39 per cent, of the material that they consider important to abstract, in Russian.

Senator Aird: The reason for my question of course is that. . .

The Chairman: You want to come back to your original question again.

Senator Aird: When one is looking for priorities and looking for a situs for personnel, the Japanese example perhaps is of some strong guidance.

The Chairman: I am sure that the under-secretary has taken your wish into very serious consideration.

Before closing, I have a question which is related to one I asked before. You have spoken a moment ago about the lawyers who were working for you now on this new great field of research. But, apart from that, and outside of the physical and life sciences, do you have in the department a division or a special service of research, doing research in the field of political and economic sciences and related fields?

Mr. Cadieux: No.

Mr. Langley: Historical?

Mr. Cadieux: We have an historical unit that looks at our archives and that classifies documents and publishes them gradually. If you bring science and history as a science in, that I think would be a scientific fact. Then we have a planning unit and, to the extent that these people are really doing research as a long range development, that is also there.

The Chairman: But there is no specific program, no specific staff engaged in regular research in support of the constant review of our foreign policy?

Mr. Cadieux: There are two operations that are going on that are related to that. One is that, for the past two years there has been, as a conscious and as a very substantial operation, a review of foreign policy going on. So far, there are three sectors that have been particularly involved. One is that of relations with Europe and defence; two, Latin America; and, three, China. Therefore, these three

sectors have been the object of very thorough, and in the case of Latin America, have been a continuing in-depth study.

This is a review and this has an additional and new feature. It involves discussions with the academic community to an extent that is unprecedented.

The Chairman: But this is done more or less on a basis of the so-called task forces, it is a one-shot operation, but you have no continuing staff?

Mr. Cadieux: There is something else. Each year the department is required to undertake, before it submits its estimates, a review of its priorities for the next five years and of its objectives within those five years for the next year. Therefore, for each year there is a very careful look at whatever it is that the department wants to accomplish in general in each area and in each country.

The Chairman: But this is done by the directors of the various divisions.

Mr. Cadieux: By the heads of the various divisions.

The Chairman: And of course by you and your immediate assistants. But again, coming back to my question, you have no continuing research staff which would have as more or less their exclusive responsibility the doing of research in support of your operation here or in support of your overseas services?

Mr. Cadieux: There is a research and planning unit.

The Chairman: How many people are there in that?

Mr. Cadieux: It varies.

The Chairman: What is its function in all this?

Mr. Cadieux: Its function is to engage in long-range review of departmental policies.

The Chairman: Could we have an additional memorandum on this? I do not think it would be necessary for you to come back, but I think it would be most useful for us to have as additional information the kind of research which is being done in the non-physical fields, in the field of the human sciences, generally, and the staff which is engaged in that operation.

Mr. Cadieux: Certainly.

Senator Grosart: Mr. Chairman, along that line, I wonder if the department has considered, as everybody else seems to have, getting a computer in, or an econometric model? I have a note here that in the University of Chicago they have constructed one called Maniac III, which is a computerization of balance-of-power components.

The Chairman: I think, if you go back to the last pages of the presentation we have received this afternoon, you will see that the department is beginning to think in those terms.

Mr. Cadieux: We are trying to find out whether we could use that.

The Chairman: They are lagging, though, as compared with the Bank of Canada, which

has gone "go-go" in terms of economic research.

Senator Grosart: Mr. Chairman, the figures that I gave in answer to Senator Aird's question have been added up by him, I see. Apparently they add up to 101. The French figure should have been 14 rather than 15. I just found that out.

Mr. Cadieux: That is close enough.

The Chairman: On behalf of the members of the committee I want to thank you and to thank also your colleagues for this very enlightening afternoon.

Au nom du comité je vous remercie infiniment.

The committee adjourned.

APPENDIX 37

THE SENATE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

B R I E F

Prepared by

THE DEPARTMENT OF EXTERNAL AFFAIRS

OCTOBER, 1968

INTRODUCTION

The Department of External Affairs does not itself engage directly in any form of scientific research or activity but the increasing extent to which science is assuming an international dimension, the importance which the scientific element has assumed in questions under international discussion and negotiation, and the ever expanding number of international organizations concerned with scientific matters, have all led to an increasing involvement by this Department in the formulation and implementation of scientific policies in their international aspect. The role of the Department of External Affairs might be described concisely as assistance to science-based departments and agencies of the Government in the formulation of science policies by providing information and advice within its competence, liaison and co-ordination with related organizations outside Canada and participation in the international discussion and negotiation of matters having a scientific content. As part of its general responsibility for keeping the Canadian Government informed of significant political and economic development abroad, the Department of External Affairs provides information on scientific development likely to be of interest to science-based departments or agencies of the Government. Similarly it acts as a

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channel for replying to certain requests from abroad for information on scientific matters, and for facilitating exchanges of visits between Canadian and foreign scientists and scientific bodies. This liaison function is carried out not only on behalf of the Federal Government departments but on behalf of and with the co-operation of the Provincial Governments. The Department also consults with science-based departments and agencies and with CIDA concerning science-oriented development programmes, with a view to ensuring that funds and personnel are used in ways consistent with our general foreign policy interests and objectives.

2. Although the Department of External Affairs employs a very limited number of scientific personnel (see paragraph 15), it is able, as required, to draw upon the resources of other departments and agencies having personnel with the required degree of specialized knowledge and skill.

ORGANIZATION AND FUNCTIONS

3. The statutory functions and powers of the Department of External Affairs are embodied in the Department of External Affairs Act (RSC 1952, Chap. 68), Section 4 of which reads, in part, as follows: "The Minister, as Head of the Department, has the conduct of all official communications between the Government of Canada and the Government of any other country in connection with the external affairs of Canada..." In

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carrying out this broad role as the department directly responsible for the conduct of Canada's foreign affairs, the Department of External Affairs acts, with regard to scientific matters as in other areas, on behalf of and in the name of the Government of Canada. However, functional responsibility for the observance and implementation of international undertakings often lies with other departments of government. This is particularly true with respect to scientific policy, where responsibility for the administration and implementation of specific international agreements tends to rest with the department or departments technically qualified to carry out the required functions. The effective role of the Department of External Affairs in these circumstances relates chiefly to the provision of political guidance and of a formal channel of communications between the functional department and foreign governments or international organizations. The Department could not, therefore, be said to have "a policy toward science" or "science policy", except under the broadest interpretation of these terms. Nevertheless, it makes a significant contribution to the formulation of Canadian scientific policy in relation to its international responsibilities.

4. The scope and variety of the Department's interests and responsibilities is extraordinarily broad and is perhaps well illustrated by reference to the United Nations, where the following specialized agencies, commissions and committees within the UN family have an interest in scientific matters:

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Food and Agriculture Organization,
World Health Organization,
International Telecommunication Union,
World Meteorological Organization,
Inter-governmental Maritime Consultative Organization,
United Nations Industrial Development Organization,
United Nations Educational, Scientific and
Cultural Organization,
International Atomic Energy Agency,
Advisory Committee on the Application of
Science and Technology to Development,
United Nations Scientific Committee on Effects
of Atomic Radiation,
United Nations Disarmament Commission,
United Nations Scientific Advisory Committee,
Committee on the Peaceful Uses of Outer Space,
Economic and Social Council (ECOSOC).

5. The UN family is not, however, directly involved in scientific research. Its scientific activities cover the political aspects of scientific research as in the case of the Committee on the Peaceful Uses of Outer Space, the collection and collation of scientific data and reports as in the case of the FAO reports on world agriculture, the establishing of international standards as in the case of the World Meteorological Organization, and in the encouragement of scientific research for the benefit of mankind in general, as in the case of UNESCO, or of developing countries in particular, as in the case of the Advisory Committee on the Application of Science and Technology to Development.

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6. In addition to the large quantity of scientific data available to Canadian scientists by reason of our membership in the UN, Canada also has the opportunity to play a significant role in the formulation of international scientific policy insofar as the UN bodies provide policy-making forums. Our membership on the Committee on the Peaceful Uses of Outer Space and on the Committee to study the peaceful uses of the seabed and ocean floor are examples of forums in which Canadian scientists, assisted as appropriate by members of the Department, can contribute to the development of an international science policy.

7. Canada also participates in numerous other international organizations related in greater or lesser degree to scientific development or research. A number of bilateral cultural agreements have also been concluded in recent years which provide for exchanges in a wide variety of scientific disciplines. Moreover, many bilateral or multilateral international agreements to which Canada is a party, while not primarily related to science or scientific activities, are nevertheless concerned with scientific developments in some of their aspects. A list of those international and inter-governmental treaties and agreements, included in the Treaty Register maintained by the Department of External Affairs, is attached as Appendix "A"

8. As well as reporting to the Department of External Affairs in Ottawa on significant scientific developments in the countries where they are stationed,

Officers of the Department serving abroad participate directly in many international gatherings and engage actively in the negotiation of treaties or agreements related to science. In certain circumstances Ambassadors, High Commissioners or other senior officers in the Department may be chosen to lead Canadian scientific or science-based delegations at inter-governmental meetings or conferences. Foreign Service Officers often accompany Canadian technical or scientific representatives at inter-agency meetings to lend such assistance as may be required on the basis of their knowledge of the political factors involved, as well as to demonstrate the broad interest of the Canadian Government in the questions under discussion. Foreign Service Officers of suitable rank also act from time to time as Observers at scientific meetings or conferences, where it is deemed to be in the interest of Canada to be officially represented.

9. Within the Department, liaison and co-ordinating functions are carried out in a variety of ways, depending upon whether the subject matter is primarily scientific, political, military or economic in nature. Political and functional divisions maintain contact with Canadian diplomatic posts abroad and with those departments or agencies of government most directly concerned with a specific subject. Thus, since nearly every disarmament question has a scientific dimension either connected with weapons technology or with methods of verifying arms control agreements, the Disarmament Division of the Department of External Affairs has frequent need of scientific advice. The availability of technical advice from the Defence Research Board, the Department of Energy, Mines and Resources and from AECL and AECS in such matters as

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civilian and military nuclear technology, seismology, peaceful nuclear explosive services and chemical and biological warfare underpin Canada's activity in disarmament discussions by enhancing the authority and independence of its contribution.

10. The North American Defence and NATO Division co-operate with the Department of National Defence, DRB, and the NATO Science Committee. The Transport, Communications and Energy Division of the Office of Economic Affairs deals with the international aspects of atomic energy, space science, telecommunications and general science, and is closely associated in its daily operations with all the major science-based departments and agencies. Area political divisions provide reports from Canadian diplomatic missions to other departments, as appropriate, as well as furnishing advice and guidance on political aspects of scientific questions under consideration in the functional divisions and other governmental agencies. The Cultural Affairs Division is responsible for arranging and co-ordinating exchanges of scientific personnel with other countries in accordance with the provisions of Cultural Agreements. The Information Division deals with numerous enquiries concerning scientific developments in Canada and provides liaison between foreign scientific bodies, particularly in the medical field, and their related organizations in Canada.

11. The European Division represents the Department on the Visits Panel which provides liaison through our embassies between certain Canadian scientific agencies and their counterparts in East European countries.

In Western Europe this Division's interest arises from the major political significance which scientific and technological co-operation has for our relations with the area, particularly with France, where recently co-operation in scientific and technological matters has made encouraging progress.

12. The Legal Division assists in the interpretation of treaties and international law as they are affected by scientific advances.

13. It will thus be seen that, with the exception of its purely administrative branches, there are few if any of the divisions of the Department which do not in some degree play a part in the Department's broad role of participating in scientific exchanges between the science-based departments of Government and other governments or international agencies. While this is but one function of the Department, the rapid growth of scientific knowledge and skills in Canada and the substantial support which Canada gives to the movement toward greater international co-operation in many scientific disciplines has proportionately increased the volume and importance of this work in recent years.

PERSONNEL POLICIES

14. Because of the increasing importance which science has played in the conduct of international affairs in recent years, greater attention has been paid to the question of the secondment of scientific personnel to certain posts abroad. The Department does not itself undertake any recruiting of Scientific Attachés, nor does it consciously recruit officers with a scientific background

for either of its two rotational streams, FSO and AS(FS). In consultation with interested departments and agencies, Scientific Attachés are selected by the Science Secretariat of the Privy Council and appointed by the Department to positions at specified posts abroad, where they are accorded suitable diplomatic rank, usually at the level of First Secretary (Scientific) or Counsellor (Scientific). The Science Secretariat also assists the Department of External Affairs in the allocation and coordination of duties. Scientific personnel remain on the strength of the Department only for the period of their tour of duty. A total of four positions have been established to date in London, Washington, Paris and OECD (Paris). It is expected that this programme will be expanded to meet growing requirements at other posts.

PERSONNEL ASSOCIATED WITH SCIENTIFIC ACTIVITIES

15. The following information is provided in accordance with Part II, paragraph 2.5 of the "Guidelines" for agencies of the Federal Government:

- (a) Current personnel establishment and people on strength by category of personnel:

	<u>Establishment</u>	<u>Strength</u>
London	1 (Counsellor - Scientific)	Vacant
Washington	1 (Counsellor - Scientific)	1
Paris	1 (Counsellor - Scientific)	1
OECD (Paris)	1 (Counsellor - Scientific)	1

- (b) None of the foregoing devote any substantial proportion of their time to administrative duties.

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(c)

	<u>Paris</u>	<u>OECD(Paris)</u>	<u>Washington</u>
(i) Country of birth	Canada	Canada	Canada
(ii) Country in which secondary education taken	Canada	Canada	Canada
(iii) Country in which University degree taken (bachelor, master, doctorate)	B.Sc & Ph.D (Canada)	B.A. & M.A. (Canada)	B.Sc. (Canada), M.A. (USA)
(iv) Number of working years since graduation; 28 and Number of years employed in present organization	6 mos.	13 6 mos.	18 6 mos.

- (d) Total number of professional staff in each degree category for each of the years 1962 to 1965 inclusive and estimates for each of the years 1969 to 1973:

Three: one Ph.D and two M.A.

The positions for Scientific Counsellors were first added to the establishment of the Department of External Affairs during the current fiscal year, having previously been provided elsewhere. The development of a programme of appointments for future years is under consideration.

- (e) Percentage of turnover of professional staff in the three degree categories for each of the years 1962 to 1967:

Not applicable.

- (f) Percentage of current professional personnel who, since graduation -

- (i) have been employed by industry at one time: none;
- (ii) have been on the staff of universities: one(33%);
- (iii) provincial departments or agencies: none;
- (iv) other Federal agencies: three (100%).

.../11

(g) Number of staff in each degree category on education leave:

None.

(h) Number of university students given summer employment in the field of scientific activities for the years 1962 to 1967:

None.

EFFECTS OF SCIENTIFIC DEVELOPMENTS ON DEPARTMENTAL OPERATIONS

16. Because of the expanding size and complexity of its operations, the Department in recent years has increasingly taken advantage of scientific and technological developments to promote increased administrative efficiency and economy. It is anticipated that the adoption or the adaptation of new technologies will further improve departmental efficiency during the next decade, particularly in telecommunications, in the processing of passports and in information storage and retrieval. More broadly, however, it is expected that the impact of new scientific and technological advances and the consequential increase in the flow of scientific information; the effects upon political alignments and strategies of new knowledge and skills; the demands for scientific and technological skills by the less developed countries, will continue to proportionately increase the role of the Department in providing co-ordination and liaison between the departments and agencies of the Government of Canada and other countries and international forums. It is already apparent that the international implications of such technological advances as communications satellites will create new problems in international law which will require the services of

trained and experienced personnel. As already indicated in this brief, interest in and responsibility for dealing with scientific matters is widely spread throughout the various divisions of the Department and, as a consequence, it is anticipated that the Department's operations, functions and responsibilities will be increasingly affected by technological and scientific advances. It is not anticipated that the basic role of the Department will change, but it can be predicted confidently that the extent of its interest, in absolute or proportionate terms, will be substantially increased within the next decade. It is the Department's intention to meet the challenge through the adoption of new techniques and the training of its personnel to meet this increased demand. The Department expects to be able, in consultation with the Science Secretariat, to provide Scientific Attachés in accordance with the quality and quantity of the demand for such services, but will also continue to fulfil its basic function of providing political guidance and assistance to the departments and agencies having relations with comparable institutes outside of Canada.

Appendix "A"CANADIAN AGREEMENTS REGARDING SCIENTIFIC ACTIVITIESBILATERAL

<u>Country</u>	<u>Topic</u>	<u>Date</u>	<u>Canada Treaty Series Reference</u>
Australia	Atomic Energy	1959, Aug. 4	1959 No. 18
Brazil	Culture	1944, May 24	1944 No. 15
Belgium	Culture	1967, May 8	Not yet published
Belgium	Scientific Relations	1968, Aug. 29	Not yet published
Denmark	Defence Science	1968, July 25	Not yet published
* Euratom	Atomic Energy	1959, Nov. 18	1959 No. 22
France	Defence Science	1962, May 25	1962 No. 7
France	Culture	1965, Nov. 17	1965 No. 21
Germany, F.D.R.	Atomic Energy	1957, Dec. 18	1957 No. 29
Germany, F.D.R.	Defence Science	1964, Aug. 28	1964 No. 18
Greece	Defence Science	1962, July 18	1962 No. 12
India	Atomic Energy	1963, Dec. 16	1963 No. 10
India	Atomic Energy	1966, Dec. 16	Not yet published
Japan	Atomic Energy	1960, July 27	1960 No. 15
Norway	Defence Science	1960, May 24	1960 No. 11
Pakistan	Atomic Energy	1959, May 14	1960 No. 14
Switzerland	Atomic Energy	1958, March 6	1958 No. 8
United States of America	Atomic Energy five agreements	1962, May 25	1962 No. 10
"	Churchill Research Range	1965, June 14	1965 No. 9
"	Communications Satellites	1963, Aug. 23	1963 No. 13
"	Ionospheric Research	1964, May 6	1964 No. 6
"	Meteorological Satellite Station	1962, Dec. 28	1962 No. 21
"	Meteorological Satellite Station	1964, Feb. 4	1964 No. 20

* The European Atomic Energy Community

<u>Country</u>	<u>Topic</u>	<u>Date</u>	<u>Canada Treaty Series Reference</u>
United States of America (cont'd)	Navigation	1964, Sep. 16	1964 No. 19
"	Satellite Tracking	1960, Aug. 24	1960 No. 19
"	Seismic Observations	1965, June 29	1965 No. 10
"	Seismic Observations	1968, June 27	Not yet published
"	Weather Stations, Pacific	1950, June 22	1951 No. 36
"	Weather Stations, Pacific	1951, Feb. 16	1951 No. 37
"	Weather Stations, Pacific	1952, Feb. 22	1952 No. 33
"	Weather Stations, Pacific	1954, June 28	1954 No. 12

MULTILATERAL

Statute of the International Atomic Energy Agency	1956, Oct. 26	1957 No. 20
Agreement concerning a Global Commercial Communications Satellite System	1964, Aug. 20	1964 No. 24
Convention for the International Council for the Exploration of the Sea	1964, Sept. 12	Not yet published
Convention on the International Hydrographic Organization	1967, May 19	Not yet published
Agreement on North Atlantic Ocean Stations	1954, Feb. 25	1955 No. 3

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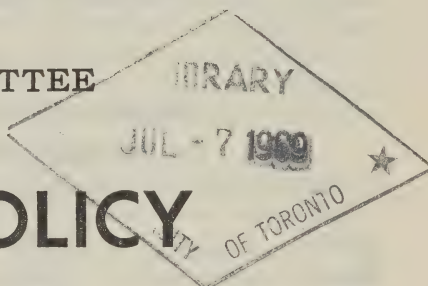


First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS OF THE SPECIAL COMMITTEE ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 39

SATURDAY, MARCH 29th, 1969

WITNESSES:

Sir Geoffrey Vickers, V.C., England; Professor Eric Trist, Professor of Organizational Behaviour and Ecology, Graduate School of Business Administration, University of California, Los Angeles, California, U.S.A.; Robin F. Badgley, Professor and Director, Behavioural Sciences, Faculty of Medicine, University of Toronto; Francis G. Bregha, Associate Professor, School of Social Work, University of Toronto; and James Ham, Dean, Faculty of Applied Science and Engineering, University of Toronto.

APPENDICES:

38. Paper entitled "Science Policy and Social Policy" by Sir Geoffrey Vickers
 39. Paper entitled "Social Aspects of Science Policy" by Eric Trist
 40. Paper entitled "Canadian Trends in Behavioural Research, a Brief Review and Assessment" by Thomas Philbrook
 41. Address entitled "Social Aspects of Science Policy" by Dr. O. M. Solandt
 42. Highlights from work-shop reports by the two Rapporteurs at the Round Table on the Social Aspects of Science Policy
 43. Address entitled "The General Goals of Science Policy" by the Honourable Maurice Lamontagne, P.C.
- prepared for the Round Table on the Social Aspects of Science Policy, under the auspices of the University of Toronto Harry M. Cassidy Memorial Research Fund.

THE QUEEN'S PRINTER, OTTAWA, 1969

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Bélisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzik
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Senate Chamber
University of Toronto
Toronto, Ontario

SATURDAY, March 29th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Carter, Kinnear, Lang, Robichaud and Yuzyk. (7)

In attendance: Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard and questioned:

Sir Geoffrey Vickers, V.C., England;

Professor Eric Trist,

Professor of Organizational Behaviour and Ecology,

Graduate School of Business Administration,

University of California,

Los Angeles, California, U.S.A.;

Robin F. Badgley,

Professor and Director,

Behavioural Sciences,

Faculty of Medicine,

University of Toronto;

Francis G. Bregha,

Associate Professor,

School of Social Work,

University of Toronto; and

James Ham,

Dean,

Faculty of Applied Science and Engineering,

University of Toronto.

(A curriculum vitae of each witness follows these Minutes.)

The Chairman, on behalf of the Committee, thanked the witnesses for their contribution to the Committee's studies.

The following, prepared for the Round Table on the Social Aspects of Science Policy, under the auspices of the University of Toronto Harry M. Cassidy Memorial Research Fund, are printed as Appendices:

38. Paper entitled "Science Policy and Social Policy" by Sir Geoffrey Vickers.
39. Paper entitled "Social Aspects of Science Policy" by Eric Trist.
40. Paper entitled "Canadian Trends in Behavioural Research, a Brief Review and Assessment" by Thomas Philbrook.
41. Address entitled "Social Aspects of Science Policy" by Dr. O. M. Solandt.
42. Highlights from work-shop reports by the two Rapporteurs at the Round Table on the Social Aspects of Science Policy.
43. Address entitled "The General Goals of Science Policy" by the Honourable Maurice Lamontagne, P.C.

At 12.17 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick S. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Badgley, Robin Francis: I: *Personal:* Born: May 6, 1931, Westmount, P.Q., Canada; Married: Jean W. R. Duncan, Stocksfield, Northumberland, England, June 18, 1959; Children: Anne Duncan Badgley, Mary Elizabeth Badgley, Peter Francis Badgley. II: *Educational Background:* 1952 B.A. McGill University; 1954 M.A. McGill University; 1955 M.A. Yale University; 1957 Ph.D. Yale University. III. *Positions Held:* 1953-1954 Lecturer, Sir George Williams College, Montreal; 1955-1956 Assistant in Instruction, Yale University; 1957-1958 Instructor, Department of Sociology, Yale University; 1957-1958 Russell Sage Post-Doctoral Fellow for Research in Pediatrics, Department of Pediatrics, Yale University; 1958-1959 Assistant Professor, Department of Preventive Medicine, University of Vermont, Burlington; 1959-1962 Assistant Professor, Department of Social and Preventive Medicine, University of Saskatchewan, Saskatoon, Saskatchewan; 1962-1963 Acting Head and Associate Professor, University of Saskatchewan, Department of Social and Preventive Medicine, Saskatoon, Saskatchewan; 1963- Senior Member, Technical Staff, Milbank Memorial Fund, New York; 1963- Visiting Lecturer, Department of Epidemiology and Public Health, Yale University; 1963- Visiting Lecturer, Department of Sociology, Yale University; 1965- Lecturer, School of Public Health and Administrative Medicine, Columbia University.

IV. *Papers given at professional meetings:* 1957: 1. With J. V. Buerkle, "Couple Role-Taking: A Preliminary Analysis," *Groves Conference on Marriage and the Family*, Michigan State University, April; 1958: 2. "Social Bias in the Treatment of Pediatric Patients," *American Sociological Association*, Seattle, August; 1959: 3. "Altruism and Marital Adjustment," *American Sociological Association*, Chicago, September; 1960: 4. "The V.O.N. and the Public," Annual Meeting, Victorian Order of Nurses, Saskatoon, January; 5. "Marriage for Moderns," Y.W.C.A., Saskatoon, March; 6. Panel Discussant for a paper on "Quality Control in the Clinic Setting," *American Public Health Association* (Medical Care Section), November. 7. "Patterns of Utilization of the General Practitioner in Rural Practice," *Canadian Public Health Association* (Medical Care Section), June, 1961. 1961: 8. "An Evaluation of the Co-ordinating Council on Rehabilitation (Saskatchewan) by its Member Agencies," Second Annual Congress of the Co-ordinating Council on Rehabilitation (Saskatchewan), Saskatoon, November; 9. Paper with R. W. Hetherington and J. W. Macleod, "Preliminary Report on a Survey of Saskatchewan Medical Students," *Association of Canadian Medical Colleges*, Quebec City, November. 10. Address: "The Integration of Therapeutic Services in the Community," *Second Canadian Institute on Mental Health Services*, Ottawa, January; 1962: 11. Paper: "The Individual Study as a Field Experience Assignment," Regional Nursing Supervisors Conference, Saskatoon, January; 12. Address: "The Ecology of Medical Practice," Seventh Post-Graduate Courses in Obstetrics, Gynaecology and Paediatrics, Regina, February. 13. Paper with R. W. Hetherington, "Social Class and the Utilization of Health Services in Wheatville," *Canadian Public Health Association* (Saskatchewan Branch), Regina, April; 14. Address: "Social

Sciences and Public Health," *Canadian Public Health Association*, Toronto, May; 15. Group Discussion Leader and Panel Speaker, *International Conference on Health and Health Education*, Philadelphia, July; 16. Group Consultant: *Saskatoon Regional Conference on the Aged and Long-Term Ill*, Saskatoon, September; 17. Panel Member: *Annual Conference of the Milbank Memorial Fund*, New York, September; 18. Paper: "The Public and Medical Care in Saskatchewan," *American Public Health Association*, Miami, October; 19. Paper: "Prospectus for Canadian Studies in Medical Education," *Annual Meeting of the Association of Canadian Medical Colleges*, Vancouver, October; 20. Consultant and Panel Speaker: *Conference on Training for General Practice* (College of General Practice of Canada), Toronto, November; 1963: 21. Address: "The Tragedy of Nursing Education," *Saskatchewan Registered Nurses' Association (Saskatoon Chapter)*, Saskatoon, January; 22. Consultant: *Regional Nursing Supervisors' Conference*, Saskatoon, March; 23. Chairman and Panel Speaker: "Unmet needs in Education for Health Workers," *Canadian Public Health Association (Saskatchewan Branch)*, Regina, April; 24. Participant: *Round Table Conference on Medical Education in Latin America*, Milbank Memorial Fund and Pan American Health Organization, New York, October; 1964: 25. Panel Speaker: "Planning, Implementation and Evaluation of Community Health Services," *Canadian Public Health Association*, Moncton, May; 26. Address: "Current Status and Review of Techniques Used in Studies of Health Manpower," *Conferencia Inaugural, Estudio de Recursos Humanos Para Salud y Education Medica*, Bogota, Colombia, August; 1965: 27. Address, with Marjorie Schulte, Behavioral Science and Medicine in Latin America: An Overview, *Round Table on Behavioral Science and Medical Education*, Sixtieth Anniversary Conference, Milbank Memorial Fund, April 5, 1965; 28. Address with Marjorie Schulte, Social Science Teaching Programs in Latin American Medical Schools, *Round Table on Behavioral Science in Latin America*, Sixtieth Anniversary Conference, Milbank Memorial Fund, April 7, 1965; 29. Address with Samuel Wolfe, Medical Care and Conflict in Saskatchewan, Thirty-Seventh Annual Meeting of the *Canadian Political Science Association*, Vancouver, June 11, 1965; 1966: 30. Rapporteur, Institute on International Medical Education, *Association of American Medical Colleges*, Washington, March 27-30, 1966; 31. Panel Speaker: "Health and Poverty," 36th Annual Meeting of the *Eastern Sociological Society*, Philadelphia, April 17, 1966; 32. Speaker with Robert W. Hetherington, V. L. Matthews and Marjorie Schulte, "The Impact of Medicare in Wheatville, Saskatchewan 1960-1965," *Canadian Public Health Association*, Quebec City, June 1, 1966; 33. Speaker with Robert W. Hetherington and V. L. Matthews, "Voluntary Health Related Behavior in Wheatville," *Canadian Public Health Association*, Quebec City, June 1, 1966; 34. Speaker, "The Social Scientist and Epidemiology," *Canadian Association of Teachers of Preventive Medicine*, Montreal, June 3, 1966; 35. Samuel Wolfe, Robin F. Badgley, Richard V. Kasius, John Z. Garson and Reynolds J. M. Gold, "A Description and Analysis of the Work of a Group of Doctors," *American Public Health Association*, San Francisco, November 2, 1966.

V. PUBLICATIONS: A. Books and Monographs: 1. Robin F. Badgley (editor), *Behavioral Science and Medical Education in Latin America*, Milbank Memorial Fund, April 1966, 244 pp. (translated into Spanish); 2. Robin F.

Badgley and Samuel Wolfe, *Doctors' Strike: Medical Care and Conflict in Saskatchewan*, MacMillan Company of Canada, Toronto and Atherton Press, New York City, (1967); 3. Samuel Wolfe and Robin F. Badgley, *The Family Doctor* (in process).

B. Articles: 1. With J. Bullock, K. B. Ladd, L. S. Levin, J. R. Lezer and K. MacDonald, *A Study of Tuberculosis Control in Vermont*, University of Vermont, February, 1959. 2. J. V. Buerkle and Robin F. Badgley, "Couple Role-Taking: The Yale Marital Interaction Battery," *Marriage and Family Living*, February, 1959. 3. With K. B. Ladd, L. S. Levin and L. R. Lezer, *Medical Care Needs—Islesboro, Maine*, University of Vermont, April, 1959. 4. With K. B. Ladd, L. S. Levin and L. R. Lezer, *A Study of Medical Care Needs—Islesboro, Maine*, University of Vermont, April, 1959. 5. With K. B. Ladd, L. S. Levin, L. R. Lezer and K. MacDonald, *A Study of the Burlington Visiting Nurse Association, Inc.*, University of Vermont, August, 1959, 101 + xiii. 6. With K. B. Ladd, *The Demography of Burlington and Vicinity*, University of Vermont, Burlington, October, 1959, 31 + ix. 7. "Analysis of 'Cost Study of Basic Nursing Education Programs in Saskatchewan,'" *Proceedings of Conference Convened by the Board of Administration of the Centralized Teaching Program*, Saskatchewan, January, 1960, 20 pages. 8. H. M. Parrish, Robin F. Badgley, and C. A. Carr, "Poisonous Snake Bites in New England," *New England Journal of Medicine*, 263: 788-793, October, 1960. 9. J. V. Buerkle, T. R. Anderson and Robin F. Badgley, "Altruism, Role Conflict and Marital Adjustment: A Factor Analysis of Marital Interaction," *Marriage and Family Living*, 23:20-26, February, 1961. 10. "Sociology in the Medical Curriculum," *Canadian Medical Association Journal*, 84:705-709, April, 1961. 11. "Social Bias in the Treatment of Pediatric Patients," *Pediatrics*, 27:829-835, May, 1961. 12. "An Assessment of Research Methods in 103 Scientific Articles from Two Canadian Medical Journals," *Canadian Medical Association Journal*, 85:246-250, July, 1961. 13. With R. W. Hetherington, "Medical Sociology: A Selected Canadian Bibliography," *Canadian Medical Association Journal*, 85:88-89, July, 1961. 14. "The Cost and Scope of Ward Activities of Student Nurses," *Canadian Hospital*, 38:46-47, September, 1961. 15. "An Interdisciplinary Assessment of Health Education," *Food for Thought*, 21:26-31, September-October, 1961. 16. With M. A. Furnal, "Appointment Breaking in a Pediatric Clinic," 34:117-123, *Yale Journal of Biology and Medicine*, October, 1961. 17. With R. W. Hetherington, "Medical Care in Wheatville," *Canadian Journal of Public Health*, 52:512-517, December, 1961. 18. "An Evaluation of the Co-ordinating Council on Rehabilitation (Saskatchewan) by its Member Agencies," Co-ordinating Council on Rehabilitation (Saskatchewan), November, 1961 (mimeo), page 19. 19. With K. B. Ladd and L. S. Levin, K. MacDonald and H. M. Parrish, "How Good are the Records Your Agency Keeps?" *Nursing Outlook*, 10:118-119, February, 1962. 20. (editor): *Proceedings of the Institute on Community Education for Health*, University of Saskatchewan, April, 1962 (mimeo). 21. With R. W. Hetherington and J. W. Macleod, "Social Characteristics and Prediction of Academic Performance of Saskatchewan Medical Students," *Canadian Medical Association Journal*, 86:624-629, April, 1962. 22. "Community Education for Health in Canada," *Canadian Journal of Health*, 53:218-219, May, 1962. 23. "The Integration of Therapeutic Services in the Community,"

Proceedings of the Second Canadian Institute on Mental Health Services, pages 72-76, Ottawa, May, 1962. 24. (editor): *Readings in Medical Sociology*, University of Saskatchewan, August, 1962 (mimeo). 25. With R. W. Hetherington: "Medical Care and Social Class in Wheatville," *Canadian Journal of Public Health*, 53:425-431, December, 1962. 26. With R. W. Hetherington: "Health Services in a Prairie Town," *Research Review*, 1:30-33, Winter, 1963. 27. Discussion on Training for General Practice, *Proceedings of the Conference on Training for General Practice* (College of General Practice of Canada), Toronto, January, 1963, page 52. 28. With D. O. Anderson, R. W. Hetherington, and E. Riches: "A Prospectus for Canadian Studies in Medical Education," *Canadian Medical Association Journal*, 88:690-693, April, 1963. 29. "Social Sciences and Public Health," *Canadian Journal of Public Health*, 54:147-153, April, 1963. 30. "The Bedraggled White Plum," *Canada's Mental Health*, 11:6-11, May, 1963. 31. "The Public and Medical Care in Saskatchewan," *American Journal of Public Health*, 53:720-724, May, 1963. 32. "Contribution of Social Sciences to Health Education," *Health Education Bulletin*, 2:2-5, May, 1963. 33. "Tragedy of Nursing Education," *The Canadian Nurse*, 59:722-725, August, 1963. 34. With Samuel Wolfe, Medical Care and Conflict in Saskatchewan, *Milbank Memorial Fund Quarterly*, 43:453-479, October, 1965. 35. Medical Careers in Public Health: A Commentary, *Milbank Memorial Fund Quarterly*, 44:143-145, April, 1966. 36. With Alexander Robertson, Foreword. Behavioral Science and Medical Education in Latin America, *Milbank Memorial Fund Quarterly*, 44:9-12, April, 1966. 37. With Marjorie Schulte, Behavioral Science and Medicine in Latin America: A Selected Bibliography, *Milbank Memorial Fund Quarterly*, 44:27-51 (Part II) April, 1966. 38. With Marjorie Schulte, Social Science Teaching Programs in Latin American Medical Schools, *Milbank Memorial Fund Quarterly*, 44:187-197 (Part II) April, 1966. 39. With Marjorie Schulte, Social Science Teaching Programs in Latin American Medical Schools, Cuaderios Medico-Sociales, September, 1966. 40. A Commentary on the Social Scientist and Epidemiology, *Proceedings of the Canadian Association of Teachers of Preventive Medicine*, 1966. pp. 60-62. 41. Colin M. Smith, Robin F. Badgley and D. G. McKerracher, Study of Mental Illness: The General Practitioner, Appendix 1, Trends in Psychiatric Care, *Royal Commission on Health Services*, 1964, Ottawa, 1966, 237-245. 42. With Colin M. Smith and D. G. McKerracher, Study of Mental Illness: The Public, Appendix 2, Trends in Psychiatric Care, *Royal Commission on Health Services*, 1964, Ottawa, 1966, 247-250.

C. Magazine Articles, Reviews, Bulletins: 1. With A. D. Robertson, "Institute on Community Education for Health," *Canadian Journal of Public Health*, 52:84-85, February, 1961. 2. Review of J. Robertson's "Young Children in Hospitals," *Journal of Health and Human Behavior*, 1:152, Summer, 1960. 3. Review of A. Conway's "The Welsh in America," *American Sociological Review*, 26:666, August, 1961. 4. Review of S. D. Clark's, "Urbanism and the Changing Canadian Society," *American Sociological Review*, 27:444, June, 1962. 5. Review of S. Mudd, editor, "The Population Crisis and the Use of World Resources," *Journal of the American Medical Association*, 189:244, July 20, 1964.

VII. OFFICES, COMMITTEES, ETC.: 1. Senior Sterling Fellowship, Yale University, 1956-1957. 2. Russell Sage Post-Doctoral Fellowship, Yale University, 1957-1958. 3. Paper on "Couple Role-Taking: The Yale Marital Inter-

action Battery," with J. V. Buerkle was selected for short listing for the Burgess Award of the National Council on Family Relations, for the outstanding research contribution to the study of the sociology of the family, 1959-1960. 4. Member, Scientific Advisory Committee, Saskatchewan Association for Mental Retardation, 1959-1963. 5. Consultant to Chairman of Royal Commission on Health Services Study of Mental Health Services in Canada, 1961-1963. 6. Chairman, Research-Consultation Division and Member, Board of Directors, Co-ordinating Council on Rehabilitation (Saskatchewan), 1961-1963. 7. Honorary Consultant to the Medical Staff, University Hospital, Saskatoon, 1961-1963. 8. Member, Nominations Committee, Medical Sociology Section, American Sociological Association, 1961-1962. 9. Consultant, National Health Grants Program, Department of National Health and Welfare, Ottawa, 1961-1962. 10. Member, Executive Committee, Canadian Public Health Association (Saskatchewan Branch), 1962-1963. 11. Member, Subcommittee on Planning for Institute on International Medical Education, *Association of American Medical Colleges*, 1965-1966. 12. Editor, *Milbank Memorial Fund Quarterly*, 1963- ——. 13. Secretary-Treasurer, Medical Sociology Section, *American Sociological Association*, 1965-1968. 14. Advisory Committee for Evaluation of Programs and Patient Care at *Harlem Hospital Center*, Columbia University, 1965. 15. Member (Social Security Administration representative), Advisory Panel for the Cooperative Research and Demonstration Grants Program, *Welfare Administration*, Washington, 1966-1969. 16. Member, Review Committee, *National Institute of Child Health and Human Development*, U.S. Public Health Service, Washington, 1966-1970.

VIII. ASSOCIATIONS: 1. American Public Association (Fellow). 2. American Sociological Association (Fellow). 3. Association of Teachers of Preventive Medicine. 4. Canadian Association of Economics and Political Science. 5. Canadian Public Health Association. 6. Eastern Sociological Society.

ADDENDUM

VI. PUBLICATIONS: A. *Books, Monographs, Chapters*: 1. Robin F. Badgley (editor), *Ciencias de la Conducta y Ensenanza Medica on America Latina*, Milbank Memorial Fund, 1967, 268 pages. 2. Robin F. Badgley and Samuel Wolfe, *Doctors' Strike: Medical Care and Conflict in Saskatchewan*, MacMillan Company of Canada and Atherton Press, New York City, May 1967, 201 pages. 3. Robin F. Badgley, *The Public and Medical Care in Saskatchewan*, in *Medical Care in Transition*, Volume III, pages 60-64, U.S. Public Health Service Publication No. 1128, Washington, D.C. 1967. B. *Articles*: 1. Robin F. Badgley, Robert W. Hetherington, V. L. Matthews and Marjorie Schulte, *The Impact of Medicare in Wheatville, Saskatchewan 1960-1965*, *Canadian Journal of Public Health*, S8:101-108, March, 1967. 2. Robert W. Hetherington, Robin F. Badgley and V. L. Matthews, *Voluntary Health—Related Behaviour in Wheatville*, *Canadian Journal of Public Health*, S8:109-116, March 1967.

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Illness, The Free Press Division of the MacMillan Company, revised edition, scheduled for publication 1968. C. Robin F. Badgley and Samuel Wolfe, The Doctors' Right to Strike, in *Ethical Issues in Medicine: The Role of the Physician in Today's Society*, in E. Fuller Torrey (editor) Little, Brown and Co., New York. Scheduled for publication Spring 1968, Chapter 18. D. Robin F. Badgley, Margaret West and Richard V. Kasius, *An Overview of the Colombian National Health Survey* in Irving Kessler (editor) University of Johns Hopkins Press.

III. TEACHING ACTIVITIES: A. Lecturer, Department of Sociology,

IV. COMMITTEES, CONSULTANT, ETC.: A. Secretary-Treasurer, Medical Public Service, Yale University, 1964-1968. C. Lecturer, School of Public Health and Administrative Medicine, 1965 to present. Colombia University.

IV. COMMITTEES, CONSULTANTS, ETC.: A. Secretary-Treasurer, Medical Sociology Section, American Sociological Association, 1965-1968 (extended ex officio to 1969). B. Member (Social Security Administration representative), Advisory Panel for the Cooperative Research and Demonstration Grants Program, Welfare Administration, Washington, 1966-1969. C. Member, Review Committee, National Institute of Child Health and Human Development, U.S. Public Health Service, Washington, 1966-1970. D. Editor, *Milbank Memorial Fund Quarterly*, 1968-1967. E. Member, Commission on the Canadian Public Health Association, 1967.

V. ADDRESSES: A. The Family Doctor: Preliminary Report of a Research Study, to Research Committee, Health Services Administration, New York City, June 1, 1967. B. Robin F. Badgley, Marjorie Schulte and Richard V. Kasius, Social and Economic Findings and Health Services in Colombia, International Conference on Health Manpower and Medical Education, Pan American Health Organization, Maracay, Venezuela, June 22, 1967. C. Social Science and Health Services Research, College of Medicine, McMaster University, Hamilton, Ontario, July 28, 1967. D. Panelist, *Speaking of Books*, Canadian Broadcasting Corporation, October 13, 1967. E. Robin F. Badgley, Carlos Herman Agualimpia, Richard V. Kasius, Alfonso Majia and Marjorie Schulte, Illness and Health Services in Colombia, Round Table on Social Science and Health Planning, Milbank Memorial Fund, October 18, 1967. F. Robin F. Badgley, Marjorie Schulte and Richard V. Kasius, Social and Economic Findings and Health Services in Colombia in *Study on Health Manpower and Medical Education in Colombia*, Volume III, Pan American Health Organization, Washington, D.C. 1968. F. Robin F. Badgley, Carlos Hernan Agualimpia, Richard V. Kasius, Alfonso Majia and Marjorie Schulte, Illness and Health Services in Colombia, in *Social Science and Health Planning*, Milbank Memorial Fund Quarterly Part II, April 1968.

Bregha, Francis J. Born in 1927, Prague, Czechoslovakia. Studied Law and Economics at Charles University and continued at the Faculty of Social Sciences, Laval University, where he graduated in Economics in 1951. Presently he is Professor of Development at the School of Social Work, University of Toronto. During his stay in Quebec, he published 'Deshumanisation du travailleur dans

l'univers communiste' and *'Etude comparative des lois provinciales du travail au Canada'*. Between 1956 and 1960 he was editor of journals and book series dedicated to European reconstruction and unity, published in London, Paris, Rome and Munich. In this capacity he took part in the activities of the European Council in Strasbourg and of several international conferences. After having served for two years as economic advisor to the Prime Minister of the Province of Quebec, he went to Latin America as director for the Andean Region of the International Development Foundation. He lectured at most of Latin American Universities, founded *'Desarrollo y Democracia'*, a journal focusing on the problems of economic and social development and worked closely with the Peruvian, Chilean and Colombian governments in the implementation of programmes sponsored by the Inter-American Development Bank. He is executive secretary of a joint Canadian-American study group for Latin America, member of the Executive Committee for the Caribbean (CIIA), member of the Society for International Development (Washington), director of International Development Foundation and member of the Board of University Settlement in Toronto.

Ham, James Milton. Dean of Applied Science and Engineering, University of Toronto. Born: Coboconk, Ontario, 1920. Education: B.A.Sc. Electrical Engineering (British Association of Advancement of Science Medal) S.M. and Sc.D. Electrical Engineering, Massachusetts Institute of Technology (Industrial Electronics Fellowship). Experience: Electrical Officer, Royal Canadian Navy; Assistant Professor M.I.T. 1951-52; Left Faculty of M.I.T. in 1952 to joint staff in Electrical Engineering at University of Toronto; Graduate research in automatic control; Department Head 1964-66; Dean of Faculty of Applied Science and Engineering, University of Toronto; Consultant on industrial automatic systems especially steel industry; Founded Associate Committee on Automatic Control of National Research Council; Member of Executive International Federation on Automatic Control; Visiting Scientist 1960 to U.S.S.R. at Institute for Automatic Control Honours: Fellow of Institute of Electrical and Electronics engineers; National Centennial Medal 1967; Fellow of New College, University of Toronto. Personal Interests: Russian literature, sailing, hockey (coached NTHL Atom Champs Confederation Year), pottery.

Trist Eric, O.B.E. Professor Trist, a graduate of the University of Cambridge, is presently Professor of Organizational Behavior and Ecology, Graduate School of Business Administration, University of California, Los Angeles. He also serves as Chairman of the Public Systems Committee, for joint programs with the School of Public Health, etc., and Chairman of the Socio-Technical Division, Western Management Science Institute. He is a part-time member (formerly Chairman) of the Human Resources Centre, Tavistock Institute of Human Relations, London. His professional career spans a period of almost forty years. In more recent years he has been Regents' Lecturer, Graduate School of Business Administration, UCLA; Development Consultant to the Canadian Centre for Community Studies, Ottawa; member of the College of Consultants, UNESCO, responsible for section on organization, support, and relation of social research to government policies; Visiting Professor, Division of Organizational Sciences, Case Institute of Technology, Cleveland; Visiting Overseas Trainer at the National Training Laboratory Summer Sessions at Bethel, Maine; Visiting Scientist, National Institute of Mental Health, Bethesda, Maryland;

Convenor, Joint Standing Committee of the Council and staff, Tavistock Institute of Human Relations; Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, California; member of the Management Committee, and Deputy Chairman and Chairman of the Committee on Human Resources, Organization, and Social Change, Tavistock Institute of Human Relations. He has been Adviser in Social Psychology to the British Army's Resettlement Scheme for British Repatriated Prisoners of War; Senior Psychologist, Lieutenant-Colonel, War Office Selection Boards; Rockefeller Research Fellow and Senior Clinical Psychologist, Institute of Psychiatry, University of London; and Lecturer in charge of the Department of Psychology at the University of St. Andrews. Dr. Trist has taught General and Social Psychology, Clinical Psychology, as well as Advanced Management Theory and Organizational Theory and Socio-Technical Studies. Prof. Trist's services on professional and scientific bodies have been widespread and international. To mention a few: he is a Founder Member of the British Sociological Association, of the Experimental Psychology Group of the British Psychological Association, and of the British Rorschach Forum. He is an Associate, National Training Laboratories, Washington, D.C.; member of the British Institute of Management, London Region; member, Comparative Administration Group, American Society for Public Administration; member of the Executive Committee, International Group for Studies in National Planning (Interplan), Syracuse, New York, and London School of Economics; Fellow of the European Institute for Trans-National Studies in Group and Organizational Development, Copenhagen; member of the Executive Committee (provisional organizing body) of the International Association for Social Psychology, London; member of the Executive Council of the Mental Health Research Fund, London; member of the Academic Advisory Board to the Centre for the Study of Collective Psychopathology, University of Sussex. He is co-ordinating Editor of the journal, *Human Relations* (London), and a former member of the Editorial Committee of the *British Journal of Industrial Relations*. Until 1966 he was Adviser to the Committee on Developments in the Next Thirty Years, British Social Science Research Council, and a member of the Psychological Committee, British Social Science Research Council. He is the author or co-author of about fifty publications, most of them too well known to require listing here. His field of interest is the development of concepts and methods, on a multi-disciplinary basis, for the study of social change and the development of people in organizations of all kinds. Through the experience of the war-time activities of the Tavistock group his interest extended to include, as well as the small group, the larger organization and its relation to its external environment. He became interested in the development of a general theory of the enterprise considered as an open, socio-technical system rather than as a closed, social system. Some five years ago he was instrumental in establishing within the Tavistock framework an Institute for Operational Research so that this approach could be combined with that of the behavioral sciences. The experience led him, with Dr. F. E. Emery, to consideration of some new problems in human adaptation under conditions of uncertainty and interdependence, and also of the way in which social and psychological factors operate in networks of institutions rather than simply within a single organization. In the last few years also he has become concerned with questions of science policy in relation to social research and its organization and financing.

This field of work fits in well with his general interest in institution building in relation to large-scale social systems and emergent situations.

Sir Geoffrey Vickers, V.C. Sir Geoffrey Vickers, a graduate of Oxford, has had a distinguished career in business, law, and government in Britain. After World War I he qualified as a solicitor and practised as a partner in a well known firm of corporation lawyers in London. Throughout World War II he was Chief of Economic Intelligence at the Ministry of Economic Warfare, and a member of the Intelligence Committee of the British Chiefs of Staff. When the war ended he joined the British National Coal Board, first as legal adviser, and later as the member in charge of manpower, training, education, health and welfare. He was knighted in 1946. Sir Geoffrey has been a director of companies, and active in many public and professional bodies in Britain, including the Medical Research Council, the London Passenger Transport Board, the Council of the Law Society, and the Council of the Royal Institute of International Affairs. For many years he served as Chairman of the Research Committee of the Mental Health Research Fund. For three consecutive years in 1956 to 1958 he served as Chief Consultant to the Round Table on Man and Industry, organized by the University of Toronto School of Social Work, which resulted in publication by the University of Toronto Press of one of his books,

The Undirected Society.

As a student of and writer of sociological subjects, including the sociology of industry, Sir Geoffrey has to his credit publication of five books and many articles in learned journals. He has travelled extensively and has lectured and written on government and administration, public and mental health, and human ecology.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Toronto, Saturday, March 29, 1969.

The Senate Special Committee on Science Policy met in the Senate Chamber, University of Toronto, at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Ladies and gentlemen, this is the first time that the Senate Special Committee on Science Policy has sat outside the parliament Buildings in Ottawa.

It is most appropriate, I think, that we are meeting this morning in the Senate Chamber of the University of Toronto, but I want to assure Dr. Solandt and Dr. Bissell that our occupation of these historic premises will only be temporary and most peaceful. We shall be no more turbulent nor disturbing here than when we are sitting in our own Senate Chamber, and this guarantee should completely reassure the authorities of your university.

I would like first to thank Dr. Hendry, on behalf of the committee, for this most thoughtful invitation. When this invitation was first extended to us, most of the members of the committee believed that they would be able to attend this meeting today, but life—even for senators—is difficult to predict. At least five of our members are on missions abroad at the moment, and three others are sick though, I hope, not seriously.

This committee has been in operation, as most of you know, since March, 1968, although it went out of existence temporarily in the summer of that year as a result of the dissolution of Parliament.

Up to now we have received detailed briefs from all government research agencies, and we have heard most of them. We shall finish this phase of our inquiry in April. Already our proceedings, since we have been in operation, are about two feet thick.

In May we shall begin hearing evidence from the private sector, including universities, industry and professional and trade

associations. We shall receive from that sector about two hundred briefs, which shows the great interest which exists in Canada at the moment in science policy.

We hope to be in a position to present our report in October, and for this reason, of course, we shall not be able to hear all those who will have sent briefs to the committee, but those written representations will form part of our record and will be most carefully studied by the members of the committee.

At the beginning of our investigation we decided to go to school, which was very much needed, and to invite a few people from Canada and abroad to discuss before us the broad issues of science policy. Most of these discussions were printed in a separate volume which has been made available to you here last Thursday. We have also taken advantage of several other occasions and opportunities to continue this learning process when distinguished visitors from abroad were coming to Ottawa. Today we have a similar occasion, and that is why we were so glad to accept Dr. Hendry's invitation.

We shall follow today our usual procedure. I will not waste any time in introducing our guests. You all know them very well by now, and their detailed biographies will be printed in our proceedings as usual. Each one of them will make a brief initial statement, after which we shall have the usual question period.

I will now ask Sir Geoffrey Vickers to initiate the discussion.

Sir Geoffrey Vickers, V.C.: Mr. Chairman, Honourable senators, I address you with a very great diffidence. I have only limited personal, first-hand knowledge of these matters in my own country and none, of course, in yours. I have had very little time to prepare this presentation, and in any case my views on these matters are affected by some unresolved doubts. So I shall keep closely to commenting on those general principles

which are referred to in the last paragraph (d) of your terms of reference.

I start from two preoccupations which might perhaps be stated. One is that I think that two basic changes are taking place which will affect the development of science. Until recently, just as all economic growth was deemed to be good wherever it occurred so long as it appeared in the GNP, so all growth of knowledge was deemed to be good wherever it appeared.

Just as in the one field that indifferent, uncontrolled growth is being increasingly qualified by the felt need to subordinate it to public policy, which in its turn is felt to need subordinating to basic human concerns; so I think the same kind of subordination to policy and to human concerns is bound increasingly to affect the development of science.

My other preoccupation is this, that the tasks of government are becoming and will, I think, increasingly become, tasks concerned with the regulation of the increasingly complex human systems, which will require increasingly more scientific study, and will thus emphasize a kind of scientific inquiry which has hitherto been only marginally present in our minds: something different, both from that pure research of which the paradigm in our minds is the discovery of new secrets of the physical world; and equally, or even more, different from applied science and technology—the discovering of new ways of doing things.

I think that the resources of science will become increasingly harnessed to this intermediate field of understanding the complex systems within which we live and of which we form part. I think that this will affect the matters with which your committee is concerned.

It seems to me to affect a question which has already been before you, of whether organizational and departmental science are to be regarded as linked to education or to technology.

Witnesses before you have already referred to the recent changes in my own country. The present linking of science and education has been criticized. It is too early to say whether it is right.

In my own brief experience before that time, I was aware of difficulties that arose when some parts of research money came from one place and others—those that went

into the university field as part of education—came from another.

I can see the logic of linking science and education, but, of course, science is equally linked to many other fields of policy; and any division which links it appropriately in one way must create some artificial severance in another.

I feel that this matter of organization is very important. Linked with it, I think great importance attaches to the way in which the statistics of the research effort are themselves carved up. I read recently that in the United States they have recently ceased to try to distinguish the basic research quotients from the other.

It may be that the money devoted to this new section of inquiry which I have distinguished, a section which once we would have thought of as operational research but which has far outgrown any such label, may have again to be distinguished. I cannot offer any question as to what is the right solution for this, least of all in your country; but I would emphasize the importance of it, and I am sure that you are very much more familiar than I with the important implications of whether one particular field of policy is departmentally included here or there or split.

The means for deciding differences of policy within a single department are, in my country at least, very much greater than those available to determine differences which cross the boundaries of departments, especially where the issue is not large enough to get to the Cabinet table. I understand that at least until two years ago—and I think this is still the same—the new techniques of policy programming and budgeting in the States have not begun to make any impact on the overcoming of departmental boundaries when considering policies which covered several of them.

Then a further question which preoccupied me greatly when I think of this, is the extent to which, and the manner in which public policy should influence the way in which science money is spent—so the directions in which it is spent, the disciplines on which it is spent, the activities on which it is spent.

Traditional views of academic freedom greatly resent the imposition of any policy decisions in this field which are not taken by scientific and academic bodies. It is extremely important that academic bodies should retain absolute freedom of what they teach and

what they do in the fields where they do it; but for the reasons I mentioned earlier it will be, I am sure, increasingly important that the direction of the effort and the field of the effort should be more and more responsible to public policy.

That does not shock me, nor present itself to me as any from of political dictation to some isolated, separate academic estate; because it is just as proper that the scientific community should be responsive to public policy as that the political power should be responsive to scientific need, including scientific need for independence.

Then this again, Mr. Chairman, is affected by one's views of the future of the institutions in which science is going to be done. This is outside your terms of reference perhaps but, nonetheless, some assumptions about it have to be made, and I find this is a matter of considerable doubt.

Universities are protean institutions; they differ considerably from what they were in the Thirteenth or even in the Nineteenth century, and no doubt they will continue to change. Nonetheless, one of the most striking aspects of the contemporary science knowledge is the growth of multi-disciplinary institutions outside the universities which are unquestionably doing science: both large organizations directly maintained by the government, large organizations directly maintained by industry, and semi-autonomous non-profit-making undertaking of a new kind which are playing an increasingly important part.

My feeling is that this extra-university science will grow, and that it should grow. I would like to think that we could look forward, and look forward at no distant date, to a world in which the institutions in which science is done fall into two powerful categories: these non-university bodies, greatly enlivened, greatly relieved in their activities by the fact that they are not so tied to disciplinary boundaries as primarily teaching institutions are bound to be, but nonetheless largely dependent for their revenues on contracts for the work they do; and, on the other hand, a university set-up primarily concerned with education and the pursuit of knowledge, which is nonetheless much more marked than it is now, in its teaching as well as its research, by the need to focus on and to be responsive to contemporary problems.

I would hope that in that set-up the non-university bodies would also take some part

in teaching, as to-day they frequently are unable to do; just as I would hope that the university side of the picture would take some part in problem-oriented research.

The only other comment I would like to make in concluding, Mr. Chairman—and I hesitate not because I am in doubt as to what it is but to try to find a polite way to say it—I mentioned earlier that the time had come when the priorities in seeking new knowledge would have to become more responsive to a policy which itself reflected human concern. That means that there must be some spontaneous, not necessarily formal, direction, to the way in which knowledge is sought. This means that not all new knowledge is to be equally esteemed and equally pursued. This is a justifiably sacred cow to which great respect should be paid. Nonetheless, I think the animal should be carefully examined for two reasons: partly because choices must be made in the apportionment of legitimate funds; and also because every country, other than the giants, must now accept the fact that it cannot do everything, and should be greatly thankful for the fact that in the pursuit of knowledge it is more easy to leave to others what one cannot do oneself, but with the assurance that it will become available free, than in any other form of human activity.

These choices do not affect the giants, because there is no one else to do it for them. They do not affect the dwarves because they do not do it anyway, they cannot do it anyway. They do affect those sophisticated middle-size powers like your country and mine, which can do a lot and which are unfamiliar with the making of these politico-scientific choices.

This is a matter which, merely because it is difficult and sensitive, should be grasped and carefully considered, and I do not believe that it is either insoluble or, in its essence, really frightening.

That, Mr. Chairman, is all I can offer, I am afraid.

The Chairman: Thank you very much, Sir Geoffrey. Now we will hear a statement from Professor Trist.

Professor Eric Trist, Professor of Organizational Behaviour and Ecology, University of California, Los Angeles: Mr. Chairman, honourable senators, Sir Geoffrey and I agreed last night that we would not compare notes, and that if I was going to say over

again some of the things that he has been saying—and I am going to do that—that perhaps that would reinforce the points.

I feel very concerned indeed about the position of the medium and smaller advanced countries, that I do not think we have a choice but to be science-based societies, for two reasons. I do not see how we can stop the world from becoming more complex and more uncertain. Therefore, we have got to learn to be much more flexible, innovative and adaptive, if we are going to build into ourselves the capability for choosing among alternative futures; because, as we all know now, there is not one future—it does not exist; there is a set of possible futures. We do not know all members of the set, and we shall not have too much information about any that are open to us, but the more that we can get the better to make these choices. That is one reason.

The other reason is economic; that nations like yours and mine, I think, have a tough struggle ahead to keep up our economic growth, to keep up our distinctive competencies alive and growing; to select them, looking at what other nation states are doing with their economies, so that we find, if you like, the right group of ecological niches in which to grow economically. For the advanced countries this means the science-based industries more and more; because if we succeed at all in bringing the developing nations along, they are going to take over the known technologies, the intermediate technologies, and if we do not push ahead with the very advanced ones then we are just going to occupy a place further and further back in the race.

So I do feel that science, and what society does with its science, and its relation of that science to technology, and the relation of that technology to what the economists—I think correctly—now call “innovation” in this sense of getting products on to the market: this is of supreme importance.

The two kinds of innovation, to me, go together: the innovation and adaptive capability towards the future, and the innovation required to keep us going in the increasingly competitive, economic world. When one sees that Canada is such a country with a small, high-quality population, it must be extremely precious to you what you do with that, being an advanced country with a small population, and many routes open to you in the future.

I mention the small population as a critical factor, because it affects how you share your

institutional arrangements. How many centres of excellence can you have in various areas of science, including the social sciences, in a country like this?

I have been for some time convinced that the time is past when one can think of having all the resources one needs in one place, in one institution; that one cannot possess them, but one has to learn to share parts, but you can have centres of excellence which are distributed in various places, of course internationally as well; but within one nation one can build up competencies that are not all just centred in one research institute or one university. We have to build up a critical mass of competence and creativeness in the areas which a society is going for, place its bets on. I believe that we are only at the beginning of at least learning to build institutions which will do this.

Coming from that to a point that Sir Geoffrey made about this new type of field of investigation of complex problems, that is at the heart of my own interests. I have called these areas “domains” because they join the concern of a society and the concern of sciences together in a big area of investigation, whether it is to the physical sciences end, or the social sciences end, or a mixture of both.

You will have all of these in Canada. These really are ecological problems. They are not just problems of small areas or one organization; they are what Michel Chevalier has called meta-problems, and they mean that we have to assemble quite large and varied sets of resources if we are going to devote the competence to investigate them and bring that investigation to the policy-makers.

I think the decision-making structure for opening up these domains is different from the decision-making structures we are familiar with in science. We use, and have some competence through, history. The scientists themselves can review the fields of their own pure knowledge and, with some kind of very complex dialogue—part of it in publications, part of it in visible ecologies—they come to know very well often what are the next experiments to make and the next investigation to do.

If one goes to the opposite extreme and looks at the users of science, whether they are government departments, industrial firms or cities, that have special problems to which they want answers, then it is they that are the dominating group in the decisions, and

the scientists are really working in their interests, but in these complex problems we are joined together in a different way.

To use Sir Geoffrey's own concept of appreciation, the insights, resetting of the problems, the perception of them, has to grow up, I feel, between the political leaders, the administrators, the representatives of industry and labour, and the scientists. We have somehow got to build groups of people who will perceive the structure of these domain problems, and this is an ongoing job that will never end, because the problems change and so on. We have got to be prepared, I think, to invest much more time. People are all busy, but what is more important than to spend time doing this kind of thing? This has really scarcely begun. That is why I feel it is so important to distinguish what I call domain-based enquiry both from fundamental research and from applied research. Obviously such domain-based inquiry feeds into both, but its recognition, I think, is important.

As regards organizational form, I would just like to run over it briefly and give some suggestions about that which my Institute in London—the Tavistock Institute—made in its first form in its report on "Social Research and a National Policy for Science" in 1962 and 1964; of which I have been thinking more in my role as consultant to UNESCO on the policy implications of the social sciences and problems of their organization and support. I suggest that there are three basic patterns which have institutional consequences.

What I have called Type A are centres of professional social science activity with associated research and development establishments to undertake work on immediate practical problems. They are profession-based and linked to user interests. They are located in government departments, or they may be consultant groups. One that I am very interested in in the United States is the Organization for Social and Technical Innovation, for example. Without these, user organizations remain without agents able to identify areas of scientific knowledge relevant to their problems. They are also without social science professionals in continuous contact with administrators. In such centres research problems are highly determined by the use of clients' needs, and they express what I have come to call the research-service mix. It is an output mix.

The opposite of that are centres of basic research associated with major teaching

facilities, located within universities usually, as autonomous departments based on a discipline of knowledge, perhaps more than one such discipline, and undertaking both graduate and undergraduate training, and maintaining science itself. Here the research problem is determined by needs of theory and method, and this is what I would like to call the research-teaching mix. This is the familiar thing which has been the great discovery since the 17th century.

Now, the third, which Sir Geoffrey has referred to: centres of applied research, domain-based research, associated with advanced research training. These were sort of resultant of the other two. I call them Type C. They are the necessary link between user organizations and universities concerned with basic work. They may be located within the boundaries of the universities, university centres and institutes, or outside of them, such as my own institute in London. They may be national centres or not. They are centred on these large problems; they are interdisciplinary. The problems are generic rather than specific. Here is a very important aspect: they accept professional as well as scientific responsibility for the programs, the projects they undertake. They contribute both to theoretical development and to the improvement of practice in the use of science. They express what I would like to call a research-application mix.

I think we need all these types of science output and all these types of organization. If one starts to think of building up the science capability of the nation, one has to think of several kinds of knowledge-output mix, several kinds of institution, and things that we have only begun to dream about.

I would like to add one special point about the social sciences, because I think it has created great confusion in the past: that the relation of theory and practice, pure and applied, in the social sciences as compared with the natural sciences, is, I think, fundamentally different; that in the sciences of man we cannot and would not experiment very much.

In the natural sciences the great secret has been to extract the problem out of its setting in nature; construct conditions, control it, manipulate it, repeat it—all these things. We cannot do that very much in the social sciences. We can in special areas, psychology and other disciplines, we can do it up to a point; but on the whole we have to reach the

data in their natural settings in society. We have to learn, therefore, to reach it. It is not easy. As a friend of mine used to say: "You cannot stop a man in the street and say 'I want to take out your appendix for the sake of pure science knowledge'". He will not let you do it. The big thing about the data in the social sciences is that we need that permission in order to reach them. So that the social scientists must get access to their data, and I think they can only do that by proving themselves in some kind of professional relationship with organizations and people. It is an analogue of what medicine has learned in taking clinical responsibility. I think more that my social science programs bear the equivalent of the Oath of Hippocrates. You see, this is the fact, that neither perhaps we ourselves as social scientists, nor does our society, with reason, trust us too much yet. Why should they? We have to earn the right to be trusted with the serious problems of man.

If the social sciences do not proceed to study the serious problems of man, they will be left with trivia on the edges.

All these serious problems of man are value-laden problems, heavily defended problems in the personality and organizations and so on; and if we are to make any contribution we have to earn the right in dialogue with our political leaders, our business and labour leaders, people in the community, everyone. We have to earn the right. We have no special privilege, except that we can apply the scientific method, if we can get to the data, and bring something back which we can feed back.

This means that what I call the social engagement of the social scientists represents a strategy for advancing the base of fundamental knowledge in these sciences, as well as contributing to the betterment of society; that the tasks are joined together in a special way. It is that thought that I leave with you, Mr. Chairman.

The Chairman: Thank you very much. Mr. Badgley.

Mr. Robin F. Badgley, Professor and Director, Behavioural Sciences, Faculty of Medicine, University of Toronto: Mr. Chairman, honourable members of the Senate, ladies and gentlemen, by comparison with other speakers during the past two days of this meeting, the role of the rapporteur is rather easy, since there is no formal presentation. On the

other hand, it is made infinitely complex because the job of the rapporteur is to attempt accurately to reflect as much as possible the general tenor of the meeting.

Another generic interpretation of the word "rapporteur", is to be mesmerised by eloquence, and certainly during the meeting there have been many who have spoken with deep conviction. I hope Professor Bregha and I have not fallen into this particular trap.

I would remind you, Mr. Chairman, that being a rapporteur is very much like an artist: it has not yet developed to the status of science. If one of the hallmarks of science is an attempt to reflect data with some accuracy, then perhaps this is an exercise in that direction.

Perhaps Professor Hendry erred in one respect in this meeting, but only in one: he chose two social scientists as rapporteurs, whereas perhaps we should have been complemented by a natural scientist.

The theme of this particular session is "Speaking Out", and we see it as our job to speak out selectively on your behalf.

The major question that concerned all of the roundtable discussion sessions was the discussion of the relationship between science and society. Some of the basic assumptions which do not appear in our report have been underscored this morning. Let me just reiterate two of these. First, it was widely assumed that government at all levels had a major and almost unquestioned position in providing support to science. Secondly, this has been brought out by several speakers this morning much more eloquently than I can phrase it: it was assumed that science should be part of society; that the quiet, small voice of the public should be accurately reflected in major decisions concerning science.

Rather than reiterate the report, Mr. Chairman, I would like to submit it for the record and to pick out two or three highlights. My colleague, Professor Bregha, will take up additional issues.

Turning to the specific structure of science policy, there were four specific recommendations which emerged. One of the key recommendations was that at a national level a broadly representative committee should be established which would represent the public, represent the various disciplines and all scientific backgrounds, which would operate independently of parochial professional interests and also free from political obligation.

Secondly—and this was brought out in the previous discussion—it was recommended that scientists in increasing numbers should be added to the staff of the various government departments, and that they should be given more adequate resources to fulfil their functions.

The third point, which is related to a subsequent one, is that government advisory panels, consisting of professionals from various backgrounds should work closely together, and the interpretation taken from the meetings seemed to suggest that in every instance these advisory panels should consist of various professionals.

Finally, as was brought out in several of the discussion groups, it was recommended that the public, in the form of key non-professional leaders, should be represented on each of these committees at the various levels.

One of the major discussion points, if not one of the latent themes of the workshops, was the question of a dialogue between the natural and the social sciences. Professor Bregha and I, in interpreting the reports of the chairmen, were tempted on occasion to incorporate some of the objectives which were used, but we refrain from so doing.

It was recommended that there should be broader inter-disciplinary involvement in basic teaching programs of all scientific backgrounds, whether these were in the social sciences, biological, medical or other sciences; that there should be greater inter-disciplinary involvement in the establishment of research projects, not when these were in full force but in their incipient stages; finally, that there should be an independent inter-disciplinary critique of research involving various professional backgrounds.

The final point I would like to make, Mr. Chairman, concerns the allocation of resources. This again was the point which was discussed in many of the groups. It was recommended almost unanimously that there should be greater emphasis given to the training and research in various social sciences.

Mr. Chairman, I will terminate my remarks here, and leave some of the other points for Professor Bregha.

The Chairman: Thank you very much. Professor Bregha.

Mr. Francis Bregha, Associate Professor, School of Social Work, University of Toronto:

Mr. Chairman, honourable senators, ladies and gentlemen, on the first day of this roundtable, a plea was issued for humility. May I assure you, Mr. Chairman, that two days later and in my present situation, I am experiencing an almost obsessive feeling of humility.

The most important impression which I brought from the workshops yesterday was the feeling that science indeed is becoming more and more a critical variable in our society. My fear is not that science is getting out of reach for society, but that important segments of our society are getting beyond the reach of science. In this perspective, the burning of a computer becomes not alone a political act but basically a symbolic rejection of what the computers stand for, namely science and technology.

It seemed, indeed, while we were summing up the conclusions of the ten groups, that we do live in an era of accelerating confrontation between man and technology. While it was recognized that technology, because of international competitiveness and the difficulty of controlling it in one single country may indeed be very difficult to tackle, and while it was also recognized that the adjustment of man to technology may be an exceedingly painful and difficult process full of failures, a challenge nevertheless emerged that personally I consider the greatest challenge to social sciences coming out of this roundtable. It is a challenge, or invitation if you wish, to stop counting the social casualties which keep falling in a flotsam and jetsam way in the flow of history, and to start devising in a more serious way those alternative futures about which Sir Geoffrey and Professor Trist have been talking in the last two days; setting our eyes for the long-term horizon, creating options for individual fulfilment and individual achievement beyond the traditional area of the labour market. That a strong and progressive policy would be needed for such a departure, I have no doubt.

One point which has been made originally at one of your initial meetings—and I would like to come back to this point because I do not believe we have covered it sufficiently in the last two days—was the remark made that the Canadian contribution to international science may, in the end, be more important than our present contribution in material aid to the underdeveloped countries. With your permission, Mr. Chairman, I shall elaborate how this could be done.

[Translation]:

Experts all agree that the gap separating rich nations from poor nations grows wider daily, and dramatically. In fact, most of the developing countries have already entered upon a period of grave crisis. The outcome of such periods of crisis cannot fail to have an effect upon the security and prosperity of Canada. The efforts of industrialized countries such as our country, are dispersed, tainted with neo-colonialism, or look too much like makeshift rescues. Aid, which is already insufficient from the outset, is badly distributed, badly used and more often than not ineffective.

Now, it seems to me that a striking example of the social application of Canada's scientific policy would be to take an interest in the problem in order to discover where the weaknesses lie, what causes this lack of imagination that makes the results of development aid so unsatisfactory.

Our country has a superior level of science. This was demonstrated to us within the past two days. Yet we share certain experiences with the Third World in the matter of development. Communications, transportation, the mining and forest industries, construction of ports and of airports, electrical energy and, more recently, the construction of subways and the development of educational television—all these are examples where Canadian science and Canadian techniques could make a truly unique contribution.

And so I take the liberty, Mr. Chairman, of suggesting to the Special Senate Committee that it ponder the possibilities of creating a mechanism of exchange and study; perhaps an institution beyond simple coordination is the answer, so that Canadian industry and universities, and the various governments, as well as the national councils that exist already at the Federal level, may define the most promising fields for the aid that Canada is considering giving to the poor nations. The Canadian International Development Agency would no doubt be the first to benefit from such a forward step, since action of that kind would enable it to see more clearly how to carry out its task. Thank you, Mr. Chairman.

[Text]

The Chairman: Merci beaucoup. Ladies and gentlemen, you have been sitting here since nine o'clock. I would propose a ten-minute break.

(SHORT RECESS)

The Chairman: I am glad to say to Dr. Solandt that we have as one of our members

on this committee a Governor of the University of Toronto, and I thought that it would be most appropriate this morning if he would initiate the discussion.

Senator Lang, would you ask the first question?

Senator Lang: Thank you, Mr. Chairman. It is certainly a great pleasure for the committee to be at the University of Toronto, and I think perhaps it is not my predilections that are bringing forth that statement, but I think it is probably shared by all of us here.

We have in this forum an opportunity to hear scientists deliberating amongst themselves and not primarily directing their attention towards what sort of recommendation or recommendations we as a committee may or may not bring in in the long run. I think in that way we get a better feeling of the environment of the place.

Working in reverse, if I may, I would like to ask the rapporteurs—one or both of them—if they might elaborate somewhat upon the recommendation No. 1 contained in the paper to which they referred, namely the constitution of a national body, a "watch dog" committee, to be established for science and society, which would operate independently of political or specific parochial professional considerations.

I do this at the outset, Mr. Chairman, because I think it is in this area that we, as a committee, are specifically seeking advice. Our constant preoccupation is to structure in some way or another the various ideas that are coming forward to us from the witnesses we have heard.

It appears to me that to conceive of such a watch-dog committee operating independently of political or parochial professional considerations is probably easier than constructing one. It might be of use to us if the rapporteurs could elaborate on the discussion as it pertained to the actual personnel and operations of such a committee.

Professor Bregha: Not being in the group where this point came up, I can only interpret the conclusions as transmitted in writing by the recorder.

The Chairman: You were not in that group either?

Professor Badgley: No.

The Chairman: Who was in that group who could speak?

Professor Bregha: It was in the group of Dean Ham.

The Chairman: Could you speak on this if you were to come forward?

James Ham, Dean, Faculty of Applied Science and Engineering, University of Toronto: This idea came up in at least our group, and I can suggest one manifestation of it which might surprise the Honourable Chairman, Senator Lamontagne. This was the suggestion that such a body might be indeed a radically transformed Senate.

Some Hon. Senators: Oh, Oh.

The Chairman: I wonder if this answer satisfies Senator Lang.

Senator Lang: Too radical, Mr. Chairman.

The Chairman: Would you like to add something? I think this answer is really too short.

Dean Ham: Mr. Chairman, speaking, if I may try to, on behalf of the group of us, the sense was perhaps to see this through indeed the activities of your own committee; that there was, I think, a sense among us that this committee that you have might be a microcosm of a larger activity which would indeed provide an opportunity for criticism of really the way it is in a large sense, not simply within the bounds of science policy but really the whole pattern and texture of the national scene.

Now, to try to constitutionalize this in some federal body related to the government would, of course, make it very difficult to obtain that virginity or freedom from political influence and parochial professional interests which has been suggested. Indeed, I cannot believe that any of us feels that such a purity is achievable in human affairs; but the notion of a conception of a Senate body that might do this was one.

The idea originated from the industrialists among us, and at that point there was no clarity about this. Various words were bandied about, words like a national academy for society, as distinct from a National Academy for Engineering, National Academy for Science and so on.

So the group had no great vision of what this might be, but thought that in the context of Dr. Solandt's remarks about the possibility of their being a Science Council and a Social Science Council, the real idea here, I

think, was the notion that as a country we lack a forum for blunt criticism of one another in an inter-field sense. It was with this idea.

The Chairman: I thought at first it was a bit unfair that at a time when we are trying to reform the scientific community in Canada, that the scientific community would turn on us and try to reform us.

Senator Lang: If I might for the moment direct a question to Sir Geoffrey Vickers: I think very rightly, sir, you underline a fact of modern political life that there is a growing awareness that the indiscriminate search for scientific knowledge must in some way or another be subordinated to a public interest or a paramount public concern.

Of course, I think we can readily recognize the dangers inherent in such a concept, but I do not think that detracts from the reality of it, and I think to-day in Canada this is an awareness that is emerging.

In your remarks you referred to the fact that scientific effort is now becoming more diffuse; it is no longer concentrated in governmental centres or university centres, but now spreading to private sector and non-profit corporations and multi-disciplinary bodies.

It seems to me that as that is a fact, we may be moving closer towards a more broadly diffused scientific approach which in all likelihood could become more divorced than before or than it is now from recognition and an attunement to public concern.

Are those two factors a dichotomy in our present situation?

Sir Geoffrey Vickers: I think, sir, that a multiplication of effective centres for scientific work would not necessarily lead to greater indifference to public policy or to human concern. I think that would depend very much on the extent to which these human concerns were in fact shared by the public, including the members of these bodies.

After all, these bodies may exist, but normally bodies of this kind will respond only to the appeals of clients; and in a situation such as that into which we are moving the clients will themselves, in greater or lesser degree, share the common concerns and motivations.

How long this kind of dialogue will in fact serve both to canalize effort in the more important directions and to preserve the

independence of view which is needed, only time can show. One can say that the more perfect the dialogue, the better that object will be achieved, but I do not think there is any better way to do it so that that development would not alarm me.

Senator Lang: I might suggest that there are people who would maintain that the interests of a client in the scientific field are not necessarily consistent with the interests of society, and I think perhaps it was in that way that I was ...

The Chairman: Senator Lang is a lawyer.

Sir Geoffrey Vickers: Yes, I would agree that if the field became dominated or if the more active part of the field was supplied by organizations which depended for their living on satisfying particular clients, those clients being pre-selected by being those who could afford to employ that kind of organization: then, of course, you might well have a very dangerous amplification of particular voices and a dangerous distortion of particular important foci of scientific power. I entirely agree with the anxiety you express, sir.

Senator Lang: If I may, for a moment, Mr. Chairman, refer to some remarks of Professor Trist, where I think he may have left us with a conundrum: he stated—and I think probably correctly—that the social sciences to-day are not trusted by the community sufficiently to enable them to deal with the serious problems which confront the community, and that the social sciences to-day must somehow prove themselves in the trust of the community.

I can conceive that this involves a chicken-egg proposition, if your remarks preceding these are correct, Professor Trist; and the difficulty of the social sciences attaining the acceptance necessary for them to carry out their full functions, I could see, would be a problem not easy of solution by the scientists alone, but which involves some sort of educational program or conditioning program on the part of some bodies other than themselves and within the community.

Would you comment on that?

Professor Trist: I think that in my own research I felt something growing in this field, that originally I felt very much, when I was working with organizations that I was coming in to help or something like that, that they were clients in that sense.

As time has gone on, I find myself now involved with organizations or larger sets of organizations where they and we really are beginning to do things together. I sense a change in my view of relations. I will give you one example.

My Institute in London, in conjunction with an institute that started in Trondheim and is now in Oslo, were asked by the Norwegian Confederation of Employers and the Norwegian Confederation of Labour to do research on industrial democracy in Norwegian industry, and then the government joined the party later.

The research is planned in a committee that consists of two elected employers from their organization, two elected trade unionists from their organization, the general secretaries of both, one or two people from the government, one or two of my senior employees and colleagues, and one or two of us. This has grown up. I do not know, in a sense, often, who is the social scientist and who is not; but these sort of things are beginning where you get groups of people coming into these relationships who really are working together. This is the kind of thing that happens, how mutual understandings grow. There is the joint responsibility for what happens.

I was talking in the coffee break about some work we did in Britain where we got related, as an institute, to the National Joint Consultative Council of the Royal Institute of Architects, Quantity Surveyors, and the National Building Trades Employers on research in communications in the building industry. This was very tough going, but we had a little group again from them and us that somehow planned the thing.

I have had very much the same experience in Canada with one of your large industrial firms that is related to my university in the United States. This is going on in many countries, I think; that there is a growth of relationship between the people who are coming forward from organizations, or even wider things than organizations, and social scientists. It is all a bit selective at the moment, but I think there is a learning process that has started.

Again, some of the experiences in France with the French regional planning commissions and their relations with social sciences in France is very worthwhile study in this respect.

So I think this is going to be an emergent thing; it will not be either us or they but a

we-they thing. It is all beginning to resolve as we all get to know how to work together.

I would suggest that some of the cases where joint research of this kind has been done in the settings of central societies, it would be well worth going into. I do not think one can just answer the thing out of one's head; one has to look at the growing tracts of experience.

The Chairman: Can I suggest you might come back later on because time is flowing.

Senator Robichaud: Thank you, Mr. Chairman. First, may I say that I am sure you spoke for all of us when you complimented Dr. Hendry and those responsible for calling this roundtable on the social aspect of science policy.

You referred to our temporary takeover of this Senate Chamber. I may say that for all of us members of the Senate who are accustomed to deliberating in the atmosphere of the red chamber, we shall now be in a better position to judge the effect of our brief stay in this blue chamber. What effect it will have on our possible reform remains to be seen.

I noted with interest the recommendation on page 5 of the "highlights from Workshop Reports" presented this morning, referring to the allocation of resources, and particularly to the recommendation that greater emphasis be given to training and research in social sciences. We are also pleased to be able to mention that science is to be part of our society.

Yesterday the *Globe and Mail* reported Dr. Solandt's proposal for the setting-up of a separate Social Science Policy Council. As reported in the *Globe and Mail*, Dr. Solandt suggested that a Federal Social Science Council be set up to contribute to the formation of national science policy. It states that Dr. Solandt at one time was enthusiastic about the idea of dissolving the existing Science Council and constituting a new one with equal representation of the natural and social sciences; but he finally selected the setting-up of a separate Social Science Policy Council. He also stated in his presentation that it seemed to him that the social sciences must be brought into policy formation at the highest level quite soon.

Now, Mr. Chairman, I would like to have the benefit of the panel's views on this most important proposal.

Professor Trist: In Britain we have had a Social Science Council now for some three or

four years. That was brought into existence through the report of the Committee on Social Studies under Lord Heyworth, which was set up at Lord Butler's suggestion. The reason for it was that it was felt that unless the social sciences had a show of their own, at least for a time, that they would not get quite so much attention, their distinctive problems not so much attention; that if they were all in with the natural sciences, the traditional dominance would be too great.

I do not know whether this is a permanent or a temporary solution, because you notice when you separate people, when they start making relations, often you have to do that.

In the United States this has been debated, as you know. There are two schools of thought: a National Foundation for Social Research like the NSF, or to build a big part of the NSF to do the same thing. They are very split about it. I think on the whole they want to keep everything in the NSF, would be my sense of it.

You will find various solutions in the different countries around Western Europe. It is, I think, a matter of very delicate perception of what is the situation in your own country as to which of these two tracks you take. I think for Britain we were certainly right to have a separate one.

Sir Geoffrey Vickers: If I might make one or two additional comments on that one, I think that whenever you see that a council exists of this kind, you cannot tell from the look of it how far it influences policy. You can be sure that it gives some money away, but how far it causes anything to occur that would not have otherwise occurred, or exercises any influence other than by merely choosing between what comes before it: this is something you can only know by having a very close look at it or being inside it.

So the extent to which these councils are in fact, as it were, policy bodies, is not always apparent from the look of them.

The other point I would like to make is that this particular field is fragmented, and difficult to make other than fragmented. In spite of our Social Science Research Council, I think I am right—and I know Mr. Trist will correct me if I am wrong—that all the industrial human relations stuff is still done—I think I am right, am I not?—in what used to be the DSIR.

Professor Trist: Not quite.

Sir Geoffrey Vickers: It is not. Is any still done there? It is hard to say. May I just point out that on the industrial side, it is very hard to distinguish social enquiries from other organizational and other enquiries.

The other point I would like to add is that there was, in addition to this, some attempt to set up yet another council to deal with environmental studies, feeling that this domain of the environment was one which would be unduly fragmented if it did not have a council itself. That did not result in the setting up of a council, but it did result in the setting up of a centre for environmental studies as a kind of half-way house.

Professor Badgley: Just briefly complementing, Mr. Chairman, some of the comments of Professor Trist and Sir Geoffrey Vickers: there seemed to be in the various workshop sessions a constant theme of revolving around the difficulty in dialogue between the natural and social sciences. I am rather diffident to attempt to interpret from the various workshops the extent to which the views which Professor Bregha and I have attempted to summarize here, accurately reflect the opinion of all present; but there did seem to emerge, at least, a thread of agreement that, given the imbalance in the allocation of public resources and training which hitherto have been allocated in large part to the physical, medical, biological sciences, that if the social sciences were indeed to make a major contribution additional funds would have to be allocated for both training and research in these areas.

Professor Bregha: It may be of interest to the members of the special committee that the suggestion regarding training actually included training at elementary and high school levels; so that the appreciation for social sciences could be developed at much earlier age than is presently being done.

This, I believe, was in the group of Dr. Rose, where a sort of analysis of present curricula in high schools was mentioned, and a disproportion between natural sciences and social sciences has been pointed out. The recommendation then was that greater importance to social science should be given early, and certainly at high school level.

Senator Robichaud: Mr. Chairman, my second question might be directed to Professor Trist. I know that some of us find it most difficult to determine exactly what the present student generation really wants.

Professor Trist, at your presentation at this roundtable group on Thursday on page 2 of your paper, you pointed out that in several countries the present student generation is turning away from science. However, on the same page you also indicated that science is a core value in the culture of our society.

My question to you would be: Is science accepted as a core value of our culture, say, particularly in North America; is there any clear evidence of this? Also, what are some of the other core values associated with science that play some inter-active role with science?

Professor Trist: You could not have asked me a tougher question. I have been stuck with the drift in the students in the University of California, Los Angeles, from the physical sciences and engineering into the school where I am, which is a business school, which is a mixed establishment of social and operational research sciences. The more adventurous people seem to be coming into these complex areas. That is one of the things.

Then a lot of people, feeling that they are just disenchanted with the scientific game in any of its names, just want to drop out of it. They feel that science has created, or been a big factor in creating, the world in which they are so alienated, and for which they hate us so much. That is the feeling I have had from my own students.

As to the notion of science being a core value, we in the west are the only civilisation in the world's history since the 17th century, that has had a continuous science process going. It has escalated, as we all know. So that on the evidence that science has built itself up as it has done, that is what I meant by being a core value.

I think it is associated with values of truth-seeking, freedom, everything that happened in the Renaissance and in the Reformation; all that set of values I would associate with science, with the emphasis on mastery and achievement which grew up in relation to the Protestant ethic, all that too; a very great valuation on the logical and analytical qualities of the mind, and of thus becoming independent people, individuals and so forth.

I think all those values have gone together; that there are other sets of values to do with collaboration, co-operation and non-intellectual forms of relationship, which may have to be looked at as well. That is another story, but that is what I meant in my remarks senator.

Senator Robichaud: Thank you.

Senator Belisle: Mr. Chairman, can I ask a supplementary question?

The Chairman: Yes, Senator Belisle.

Senator Belisle: Having in mind what you said this morning in your opening remarks, I would like to say that it is not only a pleasure to be here and not only will we leave this place in good order, but I personally question whether we should even ask questions; because when I glance at this audience I see so much experience, so much talent and so much sagacity, that I felt that just having the opportunity of rubbing shoulders with them means we shall go back to Ottawa much wiser and much richer.

Having heard what our honourable colleague said at the back, one could add to what Senator Robichaud said about the blue chamber that we Conservatives who are very happy to be sitting in the blue chamber have no objection whatsoever if Mr. Chairman wants to relay the message to the Prime Minister that we could have more of you people in the red chamber.

The Chairman: You are slightly out of order now.

Senator Belisle: My question is this. In view of the idealistic revolution going on in all our universities, is it wise for governments to continue to contract their research, or most of their research, to universities, or should they do most of their research in their own labs or facilities?

Sir Geoffrey Vickers: It may seem absurd that a visitor should venture to comment on that, but it might be of interest to your committee if I mentioned a brief exchange I had recently in New York on this subject, with someone that was not a student but was in touch with student views. I was questioning what seemed to me a ridiculous idea that a university should speak as a university on political issues, should speak up, for instance, against national policy which these particular students wish to protest. When I said that seemed to me an absurdity, I was answered by the fact that universities did not mind as entities undertaking government research. The research, of course, was more research of a kind to which they objected.

I have been thinking for a long time about the logic or illogic of these two views. It seemed to me to have logic enough to have a

bearing on the honourable senator's question, that I think that if universities act for government in a contractual way, in a way which identifies then with the nature of the contract, and if that contract has any political significance, they do render themselves open to this kind of charge, or at least render themselves liable to give this kind of suggestion to the student body.

Senator Belisle: Mr. Chairman, my question was not only in the political context; it was also in the context of values, because many scientists have a different value of values.

The Chairman: Do you have any comment? I suppose that this silence means that the panel agrees with you.

Sir Geoffrey Vickers: I would have thought that insofar as it was a question of preserving the scientist's individual freedom, he would be as embarrassed if he were in an organization directly organized by the government as if he were in a university; indeed rather more so, because there are options available to a government when placing contracts between universities, whereas any scientist working in a government establishment is committed to do what it requires.

Perhaps I still have not fully appreciated the force of the senator's question.

The Chairman: Perhaps you would like to come back to this a little bit later. Senator Carter.

Senator Carter: I had one little question set up for Professor Trist, but I really want to follow the line of questioning raised by Senator Robichaud.

This conference has been about the social aspects of science policy, and we have here this morning a little pamphlet headed "Science and Society". I have been wondering, listening to what took place this morning, reading what I could of the positional papers, if we are not looking at this problem through the wrong end of the telescope.

Society can be thought of in many terms. We can think of society as a human family, or as a civilization, oriental as against western; and even in western society we started out based on certain values. That is our western democratic society.

Science since the 17th century has largely dissipated those values, and that is why we have this student unrest in the campus. It has not put anything in place for these students,

and we have now reached a point where we have become frightened of science, because we see science getting out of control and possibly bringing society to the brink of destruction.

So should we not start out with some concept of society which will provide a framework which will shape our ideas and our scientific effort? That is my first question. Should we not approach this problem first with a definite concept of society?

Professor Trist: I think, senator, that I would like to split the question into two points.

The fact that science has now become a matter of public concern, that it has become a policy matter: it does look as though, because of everything that has happened, society through its political system is going to start regulating the scientific enterprise. That, I think has happened; that is why we are all here.

So that a rather new process has started and science policy is very, very recent. We have not much experience of it yet. We know it has terrible dangers, but we are somehow constrained to start it.

The question of a concept of society, I think you mean where are we going to find an alternative set of values that people are going to believe in and will accept. On this, I think something has to emerge; it has to grow. We cannot just make values up; they are going to arise.

I think one of the exciting things at the moment is the search for new values that is going on all over the place. A lot of it is damaged search, imperfect search, and a lot of it is very wild, but it all has a meaning in this direction.

Some of my colleagues and I think that we in the social sciences have been very slow really to set up a discipline, as it were, which focuses on the study of values, to have a science of plurality, if you like, a science for the study of values.

It is coming. We do not know much about it in social science terms yet, but one of the things that worries us a lot is that the values in the past have changed rather slowly through the generations, and that we may now be in the situation where we will have to evolve new values in modern societies more quickly than we as humans have done in the past.

You are asking questions which open up very, very big issues, and I think they are very good questions. I do not know the answer; I do not know how well we are going to come out of this one, myself, as a species.

The Chairman: I think Sir Geoffrey would like to comment on this.

Sir Geoffrey Vickers: If I might add a comment, I would have thought that only a society can determine for itself its values, and can agree upon them insofar as it can.

I think we are clearly in an acute crisis, because political and economic forces require regulation on a scale which is almost inconsistent with any satisfactory social participation; and many countries are showing the vociferous tendencies that this produces.

The passionate search for a socially satisfactory entity to belong to, even though that is much smaller than is consistent with our current means, either of regulating society as a whole or of distributing goods and services: that is one part of the dilemma.

The other, of course, is the rate of change, to which Mr. Trist has referred. These are the difficulties which set the problems which each society as it now exists, I think, has got to solve, and its own political process is the only process by which it can be solved.

Senator Carter: I have other questions but I will give somebody else a chance.

The Chairman: Ask another one.

Senator Carter: I would like to pursue this for a long time, but I can see it is going to take a long time to develop answers.

The Chairman: Certainly another long weekend.

Senator Carter: I will come back to a practical question, much as I am reluctant to depart from this. Professor Trist this morning spoke of two new aspects of scientific activity. One was innovation, and the other was problem-oriented research with a view to decision-making.

Now, we have a problem to-day with television. Television has had a tremendous impact on society. It is educational, but there are some people who think that television is also contributing to delinquency, and that has become an area of social concern.

I would like Professor Trist to develop his ideas a little further as they would apply to this particular problem, this area of concern

of the impact of TV on society as it is expressed in the problem of delinquency. How would you go about that? How would you arrive at your decision-making process?

Professor Trist: A training colleague of mine, Dr. Fred Emery, says the coming of television represents a change of the human condition as big as if man had grown a second head; that we have a very big thing on our hands now that we have a new medium.

I feel very shy about making any remarks about television in Canada, since you have in this country, I think, a person who understands the impact of that medium possibly more than anyone else. This is Marshall McLuhan's country.

You see, the medium can be used either way—for very great good or very great harm. The sort of research that social scientists have done on the effects of television and other media so far has not been very good. There have been a few dribbles of it here and there. It is very, very hard to get evidence of the effects.

Until recently I thought it was over-emphasized, because people were not taking enough account of the real things inside people's deep minds and so on and in children. All these fantasies of aggression, horror and terror, they are all there inside us anyway. They just see them on the television screen.

On the other hand, if the media, through the needs of advertising, are seeming to be sanctioning violence, if they somehow get into young children and adolescents the notion that it is a pretty good thing to be violent and aggressive and to do all these things; then I think, if that message gets through, there is a sort of a tacit understanding that in spite of all the laws and all the things to the contrary, that this is the way it is, then I would be concerned indeed about the harm. I cannot say, as a social scientist, that I know very much about it, but for me it would be a matter of trying to examine the hypothesis of how far in the perception of the receivers of the medium they felt there was a tacit social sanctioning of the values which we explicitly reject in our official morality as a society; that we turn it upside down by something that gets through, and it is very much more powerful if this gets through sub-verbally than simply in words or even in sound.

I think the danger is there all right, but I would need to think about the sort of research that we might do to help to answer you. I do not think it has been done yet.

The Chairman: Unfortunately we have only ten minutes more. Senator Kinnear.

Senator Kinnear: Thank you, Mr. Chairman. I would just like to ask a very short question. I would ask Sir Geoffrey about priorities. It is a word we hear so many times, every day, and I begin to wonder if there is such a thing as a priority.

He said priorities are human concerns he would put at the top. I wondered what he considers the first human concern he would call a priority. I think of it in terms of what Dr. Jean Boucher said this morning, thinking of pollution as it affects our everyday lives.

I had many supplementary questions, but there is not time. I would like him to tell what he considers the first priority of human concern to-day.

Sir Geoffrey Vickers: I certainly would not be able to answer that question for Canada, but I am not sure that it can be answered in general terms at all. Problems tend to define themselves in the concrete, and I think that it is only possible in a concrete situation to determine between one thing and another.

This is a very unsatisfactory reply, but I believe myself that there are quite logical and radical reasons why it is impossible to rank-order priorities in the abstract, independently from a particular situation that has been previously defined.

Perhaps some other members of the panel can do better.

Senator Kinnear: I thought of the pollution situation in Canada.

Sir Geoffrey Vickers: I have no idea how high the problem of pollution in Canada ranks by comparison with other things. You see, the other things would be all quite disparate. That is why, until the collision of interest and the choice between resources presents itself in some kind of frame of reference, I think it is almost impossible to say in the abstract what would be more important than what.

Senator Kinnear: Thanks.

The Chairman: Senator Yuzyk.

Senator Yuzyk: I want to pursue a line of reasoning here regarding social science, because it is very evident that social science is behind, and is not able even to cope with many of the problems that we have; and we do not have any co-ordinating body on social science in Canada.

My question is this. I should state first of all that we do have a Science Council of Canada; we do have an Economic Council of Canada. When we are dealing with problems of society we do not have any council.

The Chairman: Do not forget the Canada Council.

Senator Yuzyk: Well, Canada Council has nothing to do with policy-making.

The Chairman: No.

Senator Yuzyk: And recommendations, and this is what I want to bring up to date.

If you think it is worthwhile to establish such a Social Science Council of Canada, do we have enough consensus of opinion among the social scientists that in a body of this kind they would be able to pursue certain studies and come out with definite recommendations such as the natural scientists do, regardless of the fact that the scientists are chemists, physicists, biologists, because they do have certain views that they propose; would this help put the social scientists in a position to present these views and thus make the views of society and various segments of society come to the fore for the consideration of the government?

Professor Trist: I would think that you would get very different outcomes, very different results in different areas of the social sciences. I think you would get different lines of recommendations offered by different groups of social scientists. That might be a very good thing, to have the dialogue of alternative views presented in what, after all, are relatively new fields of knowledge—offered to political leaders and administrators; and to develop that kind of dialogue, I think, would have a very big back-stroke effect on the development of the social sciences themselves.

I would be even more interested if some of these councils, or whatever they are going to

be called, were really, what I would like to see, domain-centred bodies, quite a few of them really, where all the relevant interest groups participated in the dialogue to build up these appreciations.

I think we might formulate the problem in the wrong way if we just sort of put social scientists in the position of being expert witnesses and put them in a box. I know that is one thing that one can do, but there are other options in building this thing up.

I hope that in this country, where you have come to a most intense consideration of these matters now and have had a chance to look at what many other countries have done and where there were mistakes being made: that you might perhaps keep open a large number of alternatives in searching how best to do this, and discuss this with the social scientists of Canada and many others.

The Chairman: As you have noted, the program says that I am to speak at twelve-fifteen, so for me this is a very good reason, as Chairman, to call this meeting to a close—if I want to speak; but before doing so I think I can safely say that some of you, fortunately or unfortunately, will never come closer to the Canadian Senate than you have been this morning. Others who are more fortunate may be called to join us as colleagues when we have been reformed.

In any case, in closing this meeting I want again to express the gratitude of the members of the committee to Dr. Solandt and to the University of Toronto for inviting us to meet with you today.

I want also, of course, to thank our guests, especially Sir Geoffrey and Professor Trist, for having consented to appear before us and to give us the benefit of their views and their wisdom. Thank very much.

The committee adjourned.

APPENDIX "38"

SCIENCE POLICY AND
SOCIAL POLICY

Sir Geoffrey Vickers

A background paper

prepared for the Round Table

on the Social Aspects of Science Policy,

under the auspices of

the University of Toronto

Harry M. Cassidy Memorial Research Fund,

27-29 March 1969, Toronto, Canada

1. *The New Demands on Science*

I believe that the most important task of science in the next decades will be not to speed technology but to provide a guide and a critique for policy, especially social policy. I believe that the primary object of science policy should be to fit science for this double task. In this paper I describe the changes which seem to me to call for this change of role and the problems which it poses.

The broad outline of these changes is now so clear that I do not think I need spend much time in establishing it. Briefly, the problems of the Western world are increasingly problems of regulation, rather than of operations, and the environment which demands and at present defines regulation is the social, rather than the physical environment. Even where problems of regulation present themselves in physical terms, such as pollution, urban disorganization, population explosion and pressure on resources, these are symptoms of self-defeating human activities and can be dealt with only by social and political means. We do not lack the power or the knowledge needed to change one physical state into another. Whatever can be done by applying energy to material things, we are able and all too prone to do. What we lack is the understanding and the ability to govern the unstable world we have thereby made and so to impose on its future course anything like the shape of our aspirations. Hence the change in the demands which I think will be made on science. Whether science will respond to these demands will depend partly on science policy and partly on the limitations of science itself.

2. *Science Policy, Its Right and Necessity*

A preliminary question arises. How responsive is science to public policy. How responsive should it be? We are accustomed to rate highly the independence of science, to suppose that its fruitfulness is proportionate to its independence. Technology is indeed a servant, concerned to find better way of doing whatever society wants to do. But science, we say, is not a servant but a mentor.

Some measure of independence is indeed important to science but even this can exist today only in so far as public policy provides for it. Science is no longer the pursuit of the leisured rich. It is a professional activity, carried on in a variety of institutions; in universities, in the research departments of industry and government and in a few other partly independent organizations. The freedom of its practitioners depends partly on their professional ethic, which in turn is greatly affected by the character of these institutions; and this in turn is deeply influenced by the amount of public money spent on them, the way it is distributed and the return expected. How large is the total volume? How consistent is the policy? How much money goes in by way of research contract and how much by way of general grant? By what machinery is it distributed between institutions and between faculties? How much of it carries restrictions on the publication and communication of results? These are potent influences on the freedom and the future of science.

They are not the only influences, still less the only threats. On the contrary, it is, I believe, only to public policy that science can look to preserve its independence. The other pressures are stronger, less visible and far less easy to call to account.

The most obvious of these is the pressure of technology. Although there is a clear logical distinction between science and technology, they have in practice become entwined in a mutually exciting system, in which technology is increasingly the senior partner. This was not always so. Until less than two centuries ago, many technologies attained astonishing levels by methods almost wholly empirical, whilst science pursued its speculative

way with little influence from technology. But today the demands of technology increasingly determine the volume and direction of scientific enquiry, both by the questions they raise and by the support they offer. Consider the stimulus and directive to scientific enquiry which has stemmed in the last two decades from the technological development of atomic energy, space explorations and communication.

Yet it is misleading to regard these demands as stemming from technology as such. Science and technology together are only a sub-system of our society, dependent on two more potent variables which are equally interlocked. One I will call the entrepreneurial system; that singular arrangement, peculiar to the contemporary Western world, whereby autonomous corporations, often of enormous size, supply the goods and many of the services of an exploding society, as a by-product of their own inherent urge to grow. The other, the governmental system, supplies the rest of the society's essential services (from sewers to diplomats) and does what it can to regulate the whole; but as it owns virtually no income-producing assets and carries on little income-earning business, it is wholly dependent on the entrepreneurial sector for its revenues. The entrepreneurial system is equally dependent on the governmental system, as the largest employer of labour, buyer of goods and supplier of services, no less than as the source of all formal regulation. So this mutual relation is also mutually exciting. I will not pause to analyse it further but it is well to remember that it is novel and unique. The violent expansiveness of science and technology in Western cultures is largely due to their association with this larger system.

Finally, the growth and direction of science is influenced by the culture of our societies, to which in turn it contributes. The attraction of science as a career, the prestige of one branch of science as against another, express and reinforce cultural valuations. The growing prestige of research today, as against executive action in business or politics, may well be due to the fact that, in a society where all other values are confused and suspect, the increase of knowledge as such is the only value which remains unquestioned.

I suggest then that we should not be misled by outmoded habits of thought into regarding science policy as such as being in principle a threat to science, merely because it represents the intrusion of government into what was

once an independent field. Dangerous though it may be, it is much less dangerous and potentially far more useful than the other pressures to which science is subjected, not least through the demands which government makes on it not in the name of science policy but as the greatest user of science and scientists.

3. *Science Policy, Its Proper Objects*

What then are the scientific interests which it is the proper function of public policy to preserve and promote?

The first interest is that science should continue. This is not to be taken for granted. Only familiarity blinds us to the uncanny strangeness of the process by which any part of the human heritage is handed on from one transient generation to the next; and this is nowhere stranger than in science, where a body of knowledge so large, so difficult and so rapidly changing is transmitted, enlarged, revised and used by a single ongoing process. The first requirement obviously is a set of institutions of appropriate capacity, a career structure which will keep these institutions appropriately staffed in competition with all rival claims on scientists, and a policy of selection and support which will keep an appropriate stream of new entrants flowing into and through these institutions and out again to take the places of earlier generations and to meet the new demands, including the staffing of the institutions themselves.

I would insist first on the unwelcome fact that this is now a field of policy. For many centuries learning was a privilege, bought by the rich, sought by the dedicated, given away and endowed by the charitable; but only recently has it come to depend on government policy, regulating by conscious choice the claims of education, as against other priorities and of one branch of education as against another. In consequence, although far more is spent on education than ever before, the sense of shortage is far more acute. This sense of shortage will grow ever sharper, as aspirations rise relatively to opportunities; and the need for conscious choices—policy choices—will rise accordingly. These choices will decide the place of science in general education, the resources devoted to different branches of science, the distribution of resources between teaching and research, between undergraduate and post-graduate education, and between different types of education, even the salary and other differen-

tials which determine the career structure of science education. The levels at which these decisions will be taken, and the extent to which they will be taken by scientific, rather than by political institutions is itself a matter of policy.

The market regulator of supply and demand cannot replace these political choices by summing a host of individual preferences. Even where it still operates, as for instance where a critical shortage of teachers or practitioners in some scientific field reveals some significant degree of relatively poor reward, the signal is far too belated to regulate supply efficiently. In any case, I think we should decline to accept the distrust of political choice, as against market choice, which is still so often expressed. It seems to me to characterize people who have more faith in their economic than in their political institutions. Where collective choices have to be made, public debate takes the place of market bargaining in summing individual preferences. The better the democratic process, the more fully the result will reflect the priorities which the debate has engendered in the public mind—not, be it noted, the priorities which ruled there before the debate began. The political debate is a creative and a normative process. If we did not believe this, how could we justify the time we spend on it?

A further proper public interest is that ongoing science shall provide the knowledge and skills which that society in the future will most need. This sense of future need will govern many of the political choices just described. I have already suggested that these needs are changing. The change is already apparent. Twenty years ago, for example, science was being asked to solve a number of basic physical problems incidental to the use of atomic energy as a source of power. Today the unanswered questions concern the level of radiation twenty years hence, its human effects and the corresponding obligations to begin now to control the generation of radioactive waste. The second set of questions arises directly out of the first but they are different in character. They require an understanding not of atomic structures but of social and political systems. They have no obvious technological answers. And they involve a calculus which is not only economic but ethical. (1) It may be queried how far science is qualified to answer this kind of question. To

this doubt I will return. In any case, this is the kind of question on which governments increasingly seek guidance; and in response, science is increasingly turning its powers of analysis and measurement to the complex systems which are the field of government policy, such as the balance of the economy, ecological problems of urbanisation and pollution, political problems of defence and social integration. The last decade has seen the birth of new techniques for analysing and simulating these complex situations and for comparing the disparate costs and benefits of multi-valued solutions. For good and ill, these will surely grow.

They point to a third public interest which is a proper goal of public policy and one which needs to be specially guarded. In so far as public policy is based on findings backed by the authority of science, its critics must either accept those findings or produce rival ones equally well validated. The more massive the scientific effort mobilised by the policy maker, the harder it will be for the critic to confirm or challenge the basis on which it is made, even if the facts are not shrouded in official secrecy. It should therefore be a major principle of scientific policy to ensure that the resources of science are sufficiently uncommitted to the service of government to provide their own independent critique. (2)

How far this is possible only time will show; but its importance is already apparent from unhappy experience. Too many scientific predictions, bases of government policy, have already been shown to have been wrong, so soon as they became open to criticism by independent scientists. One classic example was the estimate of damage from radioactive fallout from atmospheric nuclear tests. Scientists, it appears, are no less fallible than their fellow men, once they are withdrawn from the criticism of their fellow scientists and enclosed in the goal-centred activity of an operating team. (3)

If indeed science becomes a trusted instrument for analysing and predicting the course of social systems, radical consequences will follow for the democratic process. For it will mean that not only government but also the critics of government policy and the proponents of rival policies should have access to the information, the methods and the skills which are available to government. Failing this, both halves of the dialogue will be weakened. The policy makers will ignore the criticisms of a public which they deem to be

uninformed and the public will be unconvinced by pronouncements which they cannot verify.

There is, of course, much information, officially collected, which is equally available to government and to the public. There will, no doubt, be more, Electronic data banks can multiply hugely the information now available in printed statistics, and retrieval systems can make it more readily available to all. But this, though it will be useful, will not of itself redress the balance between the policy maker and his critics and constituents. Policy making relies increasingly on models and simulations of complex situations, so designed that digital computers can be used to compare the outcomes of alternative policies. Critics are likely to quarrel not with the computations but with the models and the assumptions on which they are based; and these may be far more deeply buried than they have been in the political debates of the past.

4. *Natural Order and Man-made Order*

Science is an omnibus word. It connotes a large and expanding body of knowledge; a growing body of people and institutions concerned to extent it, apply it and pass it on; a respected method (or complex of methods) for extending and verifying knowledge; a faith that the world is regular and knowable by these methods and hence faith in scientists as experts in knowing and finding out; and a distrust of any other claim to knowledge. All these connotations have entered deeply into Western culture and affect what society expects of science and scientists and what they expect of themselves and of society.

This bundle of meanings contains some inconvenient implications. The word science, until less than two centuries ago, meant any organised body of knowledge. It has been appropriated by what we now know as the sciences, nearly all of which depend on highly developed skills and techniques. In consequence, the non-scientist holds concerning science two beliefs which are hard to reconcile. On the other hand, science is difficult, esoteric, dependent on rare and specialised skills. Its findings can only be taken on trust. On the other hand, science seems all-embracing, so that knowledge not scientifically validated—or at least not vouched for by scientists—is either of doubtful status or not knowledge at all. Many people, I think, would be embarrassed if they were asked to state and justify those of their beliefs which were not

validated by science and they might expect that any list to which they finally had to confess would be matters of faith, rather than reason—as if there was some difference of kind between those hypotheses which science has adopted and the much wider system of assumptions by which we regulate our daily lives. This concept of scientific knowledge is the unhappy legacy of a remarkable history.

In the three centuries since Descartes, the physical and biological sciences have produced an organised system of hypotheses about the natural order which is deeply impressive in its coherence, its comprehensiveness and its correspondence with observed facts. As recently as 1700 this system of thought was lacking to a degree which we today can hardly imagine. The possible objects of human attention seemed to be divided into "corporeals" and "incorporeals". Everyone agreed that solids and liquids were corporeal; but beyond that point everything was confusion. Air, heat, light, life, thought—which of these apparently "incorporeals" belonged to the material world? What was the status of the others and what their mutual relations? The early 18th century lacked even the conceptual framework within which to frame such questions. Two hundred and fifty years later matter had been first distinguished from energy and then related to it. Organic forms had been both differentiated from and related to the inorganic world by a physics and chemistry which had met at the atomic level and returned, through biochemistry, to the level of molecular biology. The whole domain of matter and energy had been so ordered as to make it possible to ask even those questions which had not been answered. Whatever surprises may be in store in the field of sub-atomic physics, I see no reason to doubt that this representation of the material order is reliable so far as it goes. (4)

Viewed as the creation of three centuries of scientific thinking, this is a triumph both for the experimental and for the logical sciences. For it is not, as is sometimes supposed, a monument solely to the experimental method. The same period which saw such great advances in the techniques of experiment and observation, witnessed also a phenomenal rise in the logical sciences; both logic itself and all the branches of mathematics. These have produced a marvellous instrument for representing complex relations and working out their implications. Science proceeds not only under the impulse to comprehend still unexplained phenomena but equally under the urge to

remove from its own conceptual structure whatever is anomalous, arbitrary or even inelegant.

This triumph in representing the natural order has hugely increased faith in science and in the scientific method. In consequence, science now exercises an authority such as no combination of doctrine and institutions has exercised since the heyday of the mediaeval church. This authority has extended even to areas which science has not yet ordered or shown its ability to order.

Descartes drew a sharp distinction between mind and matter. For him, only the material world belonged to the natural order. But even in his own generation voices were to be heard, suggesting that mind, no less than matter, was explicable "mechanically". Between these dissenters from Cartesian dualism there soon appeared a schism which is at least as sharp and important today. Some understood by machines no more than their current ideas of machines could include. Others were prepared for an indefinite enlargement of the concept of the machine. These last had to fight on two fronts, as they still must—against the reductionists, not for certainty in terms of the concepts they already have; and against the descendants of Descartes, hostile to anything that might blur the sharpness of his dichotomy. I shall have more to say later about the current form of this controversy.

Descartes' dualism has lost its hold; even for those still loyal to it, the empire of matter has widened. Since Darwin, man, for most people, has been seen as part of the natural order. Even his uniquely human mental processes have been regarded as natural products of evolution. I personally accept this view; but I do not accept the conclusion which is sometimes built on it. "Science" so the argument runs "knows how to explore the natural world. Man and his works are part of the natural world. Therefore science knows how to explore man and his works".

This argument, it seems to me, is fallacious, if it be taken to mean that man and his works can be understood in the terms which peculiarity of man to impose on his experience and on all his works, especially on his relations with the other men, an order which is of his own making. Each individual is nursed into humanity through a culture which is itself the product of human history. Each tests this inheritance in the alembic of

his own unique experience. Each suffers, participates in making and is changed by the developing culture which conditions his own and his children's generation. Whatever view be taken of his ordering process, it is different from that which is built into the natural world. No one has yet succeeded in expressing it in terms of the natural order and I do not think that anyone ever will. It needs a distinguishing name. The order, political, economic, social and cultural of which each of us is part is a man-made order. Each of us is himself a man-made order, an individual and social artifact.

The study by mean of the man-made order of which they are part is beset with difficulties and lighted by insights which do not attend the study of the natural order. These oddities specially need to be acknowledged and can usefully be acknowledged today, partly because of the dominant importance of the man-made order and partly because advances in the physical sciences have supplied a bridge which was not available to Descartes.

5. Information and Meaning

Little more than two decades have passed since science distinguished information from energy as a respectable scientific concept. The distinction had always been tacitly acknowledged but to distinguish it formally was, I believe, as important a step as was the distinction of matter and energy in the previous two centuries. And just as matter and energy, once fruitfully distinguished, proved later to be surprisingly related, so energy and information may some day be brought within a common conceptual framework. But today the need is to clarify the distinction and make room for information concepts in a natural order which was formerly conceived solely in terms of matter and energy.

Biologists have always been aware that organisms rely on at least two types of information system; those which regulate the growth, development and functioning of the creature itself and those which regulate its relations with its surround. And it has been obvious that the second were mediated by signals received through the senses. But of these, the internal systems involved many physical and chemical interactions which could be explored without introducing information concepts; whilst even the latter could be analysed without making daring assumptions about learning, so long as specific re-

sponses, whether natural or conditioned, could be lined with specific stimuli. In any case, information concepts were still lacking.

Meantime, communication engineers were busy improving the technology of transmitting signals in human communication systems; and their language affected the concepts of biology. It became common to compare the central nervous system with a telegraphic communication system, having exchanges which coupled afferent with appropriate efferent messages. But this left untouched all the major problems of learning, interpretation and meaning.

This preoccupation with transmission was the context in which information theory was born. Its originators were engineers and mathematicians concerned with problems of transmission, such as channel capacity and signal-noise ratio. They could take for granted the process of interpretation which makes information informative.

But in another context communication engineers soon had a much wider interest. In designing automatic processes, such as the controls of anti-aircraft guns and homing missiles, industrial process controls and space satellites, they were designing not merely transmission systems but senders and receivers also. They were thus involved with the interpretation of messages—at first the simple triggering of an action by an order, as, for instance, the response to a thermostat, but soon more complex responses, involving the storing of information and the carrying out of logical operations on it, producing further information to be stored and processed. The resources of the digital computer as a logical engine opened new practical possibilities for devising self-controlling assemblies, and at the same time supplied new words and concepts which extended far beyond the fields in which they were born. The models of the communication engineer were already in some respects beyond those which had previously had to serve the needs of neurophysiology, psychology, ethology and the social sciences, and the new concepts fertilised them all.

Of these concepts, the most familiar, feedback, has two implications, of which the more important has not yet, I think, been sufficiently recognised. To most people, I suppose, feedback suggests "control by error", as exemplified by the automatic pilot. Deviation from course generates a signal which triggers

some corrective action. The idea is of very general application, and serves to describe the means by which many different kinds of system hang together and learn from experience.

But far greater interest, I think, attaches to the nature of the signal itself. Error is not a simple concept; it implies deviation from some norm. No signal informs us of error, unless we have a standard of comparison. The standard may be set from outside the system. Like a ship's course, or built in, as into the controls of a ship's stabilisers or it may be learned from experience. In human terms, it may be an intention or an expectation or an obligation. But without some standard of comparison the "fact" has no significance as information, though it may serve to trigger some action with which it is specifically linked.

Thus information is, as Professor D.M. MacKay has pointed out, (5) an incomplete concept. It informs only a mind equipped to give it meaning by comparing it with some standard. Its meaning is a joint function of the signal and the receiving mind, which are mutually related as are a lock and a key.

To realise the key role played by such standards in giving meaning to experience focusses attention on the process by which such standards are evolved. This would seem to be central to the development both of personality and of experience. It is a circular process; emergent standards order experience and are in turn moulded by the experiences which they order. The process is familiar in many fields. It is exemplified by a child learning to distinguish and name objects and by a medical student learning to make a diagnosis. It is exemplified in the growth of the common law, and in the development of scientific theory. It is exemplified equally in the growth of moral codes, aesthetic canons and political interests. All judgments, perceptual and conceptual, scientific, ethical, political and aesthetic involve ordering some part of experience by reference to standards distilled from past experience, which are themselves further changed, however imperceptibly, by their further use. (6) The process was elegantly described in general terms as long ago as 1879 by G.H. Lewes: "...the new object presented to sense or the new idea presented to thought must also be *soluble in old experiences*, be re-cognised as like the... otherwise it will be unperceived, uncomprehended." (7)

Thus science is at last approaching a concept of the natural world sufficiently sophisticated to accommodate scientists, let alone politicians, judges, poets and business men. For this structure of standards which gives meaning to experience is the man-made world. Its existence has always been assumed by scientists, since without it science could not exist. None the less, it is, I believe, of great importance that science should have explicitly identified the point at which the man-made world takes off, as it were, from the natural order and the nature of the medium in which this human "making" takes place. (8)

The change has many implications which it would be inappropriate to follow here. It transcends both the dualism of Descartes and the reductionism of Laplace. It illuminates the nature both of facts and of "values", as well as the much debated relation between them. It offers a model of the ordering mind and the valuing process which accommodates all the different kinds of value which we are accustomed to distinguish. In the context of this paper, its importance lies in the light it sheds on the differences between the physical and social sciences and hence between the responsibilities of their respective practitioners.

6. *The Status of the Social Sciences*

I believe that the urge to understand is as valid and as fruitful in the man-made world as in the natural world and that the attitude, the faith and the methods of science have no less a contribution to make to its satisfaction. But it is all the more important on that account to use the insights which science has already given us to understand the differences that are involved, when men turn their attention to themselves and their societies.

The most obvious effect is on the scope for experimental method. Classically, this requires repeated observations of situations, whether experimental or natural, in which all the relevant variables are known and are either constant or changed only in known ways. If the advancement of science depended wholly on these conditions, it would have moved much less fast and less far than it has; for they are often lacking in complex situations and necessarily lacking in the study of a single historical process.

This matters less in so far as the course of an historical process can be predicted or understood from an understanding of its non-historical constituents; as, for example, the

course of events which leads to an avalanche in a particular snow slope can be explained—though seldom predicted—in terms of invariant laws. This, however, is far less possible in the man-made order than in the natural order, partly because the individual constituents of the man-made order are themselves such varied historical systems, but chiefly because man-made orders are shaped and held together by communication, which depends for its meaning and effect on contexts given by culture and history. Analysis has proved a most powerful tool in exploring the natural order, because so many of the secrets of physical interaction are found at the molecular, atomic and sub-atomic levels. We cannot assume that the same will be true of man-made orders; there is much evidence that it is not. Nor can we rely on statistical methods to bridge the gap, useful as they are. The regularities which they disclose are also liable to be vitiated by historical change.

Warren Weaver (9) described the classical achievements of science as limited to two fields which he called organised simplicity and disorganised complexity. The regularities of the first can be expressed as invariant laws, those of the second as statistical laws. But what of the field of organised complexity in which we effectively live? This is the field which system theory seeks to comprehend and model. And to it science is bringing, as it has always brought, illumination, coupled with an associated threat. The illumination comes from that combination of method and attitude which, at its best, is the surest guide to the human mind in its search for truth in any field. The threat is from the dominant urge to extend the empire of science by beating the questions posed by human experience into a shape which the current concepts of science can express and its current techniques can handle.

One contemporary expression of this ancient threat is the dominance of the digital computer, both as a technique and as a conceptual model. It seems to me clear beyond reasonable doubt that the human mind, in its more important activities, does not function as a digital computer. This has been argued urbanely by D. M. MacKay, polemically by Hubert L. Dreyfus and doubtless by others and I find it convincing. This is not to say that analogue computers may not one day make up the deficiency; once again, "mechanists" and "vitalists" make common cause against those who realise that their concept of

a machine is and must forever remain open-ended. Meantime, the heady excitement of the new tool invites the policy maker to limit his questions to those which this essentially moronic instrument can answer; to over-value its assured but always conditional answers, by comparison with his own more doubtful answers to more radical questions; and finally to distort his conception of the problem itself. It has been suggested that the singular lack of success which has attended American operations in Vietnam—perhaps the only aspect of that controversial event on which nearly everyone agrees—may partly reflect the fact that it is the first war to have been fought with the benefit of the computer. (10)

It is, I believe, certain that the situations which governments must try to regulate can never be modelled or predicted or understood to the extent or in the way in which science can model and predict and understand the natural order. But this does not mean that science is less useful in the context of the man-made order or that the politician must at some point reject the methods of science and rely upon some obscure and radically different faculty, commonly called intuition. There is, I believe, no such gulf between the methods of science and of common sense. Science also is intuitive. Science also has to use even its most tentative hypotheses, however unconfirmed and unsatisfactory, until it can confirm, correct or replace them. Science also must have regard to the coherence of its hypotheses with the rest of its conceptual system, no less than with their power to explain or predict event. The methods of science are the methods by which men cooperate to gain, preserve and refine their understanding of anything to which they turn their attention, including themselves and their societies.

Yet two major differences affect the social sciences, and science policy must take account of them.

In exploring the natural order, scientists have seen themselves as discoverers. Believing that the natural order was regular and knowable, they have set themselves to represent, in terms accessible to the human mind, an order which they believed to be already inherent in reality. When rival theories computed, they believed that time would show which most nearly approximated to the real. There was one and only one right answer waiting to be found. Though philosophical doubts have often arisen as to the kind of knowledge which science yields, it has not

been supposed that the human mind could impose on the natural order a pattern of its own devising. On the contrary, one of the missions of science has been to disabuse the human mind of these illusory hopes.

The social order, by contrast, is indeed to some extent man-made and capable of being remade by man. So at least most men inescapably believe; if they did not, there would be no governments for scientists to advise and no science policy to focus this conference. There are indeed many man-made orders at every level from the personal to the international, all in constant change. And even where these changes are not deliberate (as, of course, most of them are not) they are the product of human cultural history, which, as is generally believed at least in Western cultures, cannot be expressed as a mere function of non-human changes.

The function of the social scientist remains formally as distinct from that of the policy maker as is the physicist's from the engineer's. But the subject of his study is not only the man-made order but the ordering process itself; and to this process he cannot help making his own contribution. The economic man, for example, was supposed (at least in retrospect) to have been merely a set of hypotheses about the behaviour of men in a perfect market, comparable with Newton's hypotheses about the behaviour of matter in a frictionless world. In so far as they proved to have predictive value, these assumptions claimed the same authority as any other scientific hypothesis. But the parallel was imperfect in two major respects. It mistook for invariant aspects of human nature the characteristics of a peculiar culture, which was in rapid change and was destined to change still faster, because of the activities which economic hypotheses would speed. And further, it ignored the effect which the economic man would have on the course of affairs which he was invented to predict. For nearly two centuries he has powerfully moulded the expectations which Western men have entertained of themselves and each other. And he has proved so useful to economists that they are reluctant to part with him, even though he becomes ever less useful and less realistic. He has been displaced partly by his own success. Like the model so beloved of experimental psychologists, he was a hungry rat; and men, as they grow more affluent, behave ever less like hungry rats. On the other hand, his success has fortified his hold on life, especially among his creators.

The concepts which social scientists use to model the man-made order are more expendable than they like to believe.

This difference between the natural and the man-made order involves one still more radical difference between the roles of the physical and the social scientist. The social scientist is necessarily a critic of the order which he studies, as the physical scientist can never be.

The physical scientist devises a conceptual system which reflects the regularities of the natural order; and the technologist, using the knowledge which this system yields, manipulates the natural order, not by changing but by using its laws. The distinction between scientist and technologist is clear, and so is the relation of both to the natural order. But the social scientist observes a situation in which rival orders are fighting for dominance. The standards which give meaning to experience are not only facts but artifacts, sometimes even what Professor Seeley (11) has called *fidefacts*—standards which are made effective simply by being believed. In making these explicit and drawing out their implications, social scientists cannot help taking part in the ongoing exercise of mutual persuasion which helps to determine not only the shape of the future but even the meaning of the past. The meaning of last year's revolution, for example, will not be known until history reveals its future outcome and this is partly a function of how it is regarded now.

Controversy still centres on this issue; it is not to be disposed of in these few words. But I think a conference on science policy should recognise that, in fostering the social sciences, governments not only speed the developments of conceptual systems more adequate to describe the social milieu and its contemporary problems. They also call into being an informed body of critics, whose innovating insights will affect, as well as reveal the system which they describe.

And this, if it is a risk, is one which I think should be taken. As the scale of interaction rises and the pace of change quickens, the scope for government becomes increasingly limited by the difficulty of understanding the situation in which it is acting. And this limitation affects not governments alone but the governed also. Both need all the enlightenment that science can give them and this cannot be relevant, unless it comes from scientists who are deeply concerned with the

course of events. The voice which says "Let me show you where you are going" speaks in the indicative mood and expresses an objective view; but the aspects of the future which it chooses to describe are and should be selected by an impassioned concern for the dominant human values of its time and place and by a sense of the area in which both the scientist and his fellow men can and should take a hand in the moulding of their destiny.

Notes and References

(1) The fullest discussion known to me of this issue is by Dr. E. F. Schumaker in the Des Voeux Memorial Lecture, given at the 1967 conference of the National Society for Clean Air. See also Dr. C. J. Watson's letter to the *London Times* of October 25, 1967.

(2) Dr. Donald N. Michael discusses this in *The Unprepared Society* (New York: Basic Books, 1968).

(3) For a more detailed discussion of this and other illustrations see Professor Barry Commoner, *Science and Survival* (London: Gollancz, 1966).

(4) See S. Toulmin and J. Goodfield, *The Architecture of Matter* (London: Hutchinson, 1962).

(5) D. M. MacKay, an unpublished contribution to a Wenner-Gren symposium, September 1962, "Communication and Meaning—A Functional Approach".

(6) The point has often been made. I am specially indebted to Professor Woodger's *Biological Principles* and to Bruner, Goodnow and Austin's *Study of Thinking*. The evidence concerning the formation of perceptual schemata is summarised in M. L. Johnson Abercrombie's *Anatomy of Judgment*.

(7) G. H. Lewes, *Problems of Life and Mind*, 1879, quoted in M. L. Johnson Abercrombie's *Anatomy of Judgment*.

(8) I have expanded this argument in *Value Systems and Social Process* (London: Tavistock Publication and New York: Basic Books (1968), ch. 9).

(9) Warren Weaver, "Science and Complexity," *American Scientist*, Vol. 36, No. 4 (1948).

(10) Andrew Wilson, *The Bomb and the Computer* (London: Barrie and Rockliff 1968).

(11) J. R. Seeley, *The Americanization of the Unconscious* (New York: International Science Press, 1967).

APPENDIX "39"

SOCIAL ASPECTS OF SCIENCE

POLICY

Eric Trist

A background paper

prepared for the Round Table

on the Social Aspects of Science Policy,

under the auspices of

the University of Toronto

Harry M. Cassidy Memorial Research Fund,

27-29 March 1969, Toronto, Canada

Positive or Negative Science Policies: A choice

Since the Scientific Revolution in England in the 17th century the cultural process we know as science has been proceeding at an exponential rate. Its effects on technology have transformed not only Western societies but the world environment. Having altered man's conception of the universe and of himself it has altered also his chances of survival. For it has enabled him to produce the weapons to destroy himself, the medicine to jeopardize his food supply by overpopulation, and industrial products irreversibly to despoil his habitat. By the same token it has given him the means of passing beyond the state of bondage to which he has been historically accustomed to a society where the quality of life could be of a different and higher order.

Few would care to predict which of these destinies will be ours or what dangerous and unstable mixtures of the two we may have to endure before (if ever) saner balance is struck. Science, through which the 19th century so confidently thought we could control the world, is seen in the latter part of the present century as the means through which we are making the world uncontrollable. As Sir Geoffrey Vickers* has put it, "we have reached the end of free fall". The world which our scientific culture has been making is no longer auto-regulative. This scientific culture has begun to disturb a number of the balances in the social and bio-physical ecology on which as a species we have depended.

The forces unleashed have become too powerful to be contained simply by the natural interplay of other forces.

To understand why this is so requires an appreciation of what has become the salient characteristic of the contemporary environment, namely, that it is taking on the quality of a *turbulent field*. This turbulence arises from the increased complexity and size of the total environment, together with the increased interdependence of the parts and the unpredictable connections which arise between them as a result of the accelerating but uneven change rate. This turbulence grossly increases the area of relevant uncertainty for individuals and organizations alike. It raises far-reaching problems concerning the limits of human adaptation. Forms of adaptation, both personal and organizational, developed to meet a simpler type of environment no longer suffice to meet the higher levels of complexity now coming into existence. My colleague, Dr. F. E. Emery, and I attempted to describe this quality in a joint paper some years back.* He has recently elaborated the analysis then made in a report to the British Social Science Research Council on "The Next Thirty Years".** My own recent thoughts are set out in Part I of the Supplement as they would take too long to present here.

The root question concerning the social aspects of science policy seems to me to be this. Can science, which has been the sine qua non among the factors leading us towards a less unregulable world, be the sine qua non also in leading us towards a more regulable one? A negative answer would have as a consequence advocacy of a negative science policy—a withdrawal of resources from science and its disestablishment as a core value in the culture of our society. A positive answer would have as a consequence advocacy of a positive science policy—the invest-

* F. E. Emery and E. L. Trist, "The Causal Texture of Organizational Environments," *Human Relations*, 18, 1 (1965).

** F. E. Emery, "The Next Thirty Years: Concepts, Methods, and Anticipations," *Human Relations*, 20, 3 (1967).

* Sir Geoffrey Vickers, *Value Systems and Social Process* (London: Tavistock Publications, 1968).

ment of increased resources in its already extensive domain and its even firmer establishment as a core value.

Whatever else it may claim to be the present is the age which has brought science into politics. Positive science policies are becoming more common and more comprehensive in ever more countries. The escalation of government scientific expenditure during the 60's has been greater than in other fields. Yet there are signs in several countries of a turning away from science in the present student generation. A number of places, for example, in science and technology have not in recent years been taken up in British universities. We cannot take it for granted that our societies will continue to support positive scientific policies.

One of the consequences of government supplying the bulk of R & D funds is that the ordinary citizen will have an increasing say, however indirectly, in the affairs of science. For, in democratic countries at least, the continuation of a government depends on the support of the majority of the citizens. Their intuitive appraisals of scientific, as of more familiar, issues must be taken note of. This is an aspect of science having become political which has been less discussed than that of some constraining of scientific choice as regards what the scientist may himself do. It is an innovation, however inadvertent, that constitutes a safeguard.

I suggest that Western societies, and in the longer run others, will not continue to support positive science policies unless the world view of science can be shown to be reconcilable with human values. Ordinary Western man—who is far from ill-educated now and will become better educated—requires evidence that science can at bedrock be trusted to work in the human interest. I also believe that the increased complexities of the contemporary environment cannot be understood—far less their instabilities controlled or their potentiality or beneficent change realised—without the assistance of a science developed beyond its present capabilities. The costs of abandoning a positive science policy would be penal. The case, however, for continuing a positive policy must be made. It cannot be taken for granted. It can only be made, in my view, on the basis of the social aspects. This paper will attempt to outline this case.

New Concepts of Science

Three changes have occurred which have made science more 'human' than it seemed

several decades ago. These are the abandonment of the belief in total explanation, the abandonment of reductionism and the appearance of an integrative, in addition to an analytic, strategy.

The scientific world view which prevailed in the 19th century, and which still haunts the popular image of science, was not reconcilable with human values. For a model based on mechanism, atomism and determinism scarcely depicted a world which men could live in when all other possible worlds were ruled out. The coming of the relativity and uncertainty principles upset this view in the physical sciences. The more sophisticated concepts that have followed have removed the dogmatism from science, putting a limit on the realm of scientific explanation. Michael Polanyi* has summed the paradoxical result up as follows:

"The current situation in the philosophy of science is a strange one. The movement of logical positivism, which aimed at a strict definition of validity and meaning, reached the heights of its claims and prestige about 20 years ago. Since then it has become clearer year by year that this aim was unattainable. And since (to my knowledge) no alternative has been offered to the desired strict criteria of scientific truth, we have no accepted theory of scientific knowledge today.

"Take Ernest Nagel's widely accepted account of science. He writes that we do not know whether the premises assumed in the explanation of the sciences are true; and that were the requirement that these premises must be known to be true adopted, most of the widely accepted explanation in current science would have to be rejected as unsatisfactory. In effect, Nagel implies that we must save our belief in the truth of scientific explanations by refraining from asking what they are based upon. Scientific truth is defined, then, as that which scientists affirm and believe to be true.

"Yet this lack of philosophic justification has not damaged the public authority of science, but rather increased it. Modern philosophers have excused this unaccountable belief in science, by declaring that the claims of science are only tenta-

* Michael Polanyi, "The Growth of Science in Society", *Minerva*, 5, 4 (1967).

tive and ever open to refutation by adverse evidence. And this has added to the authority of science. It was taken to show that, while scientific knowledge was supremely reliable, scientists were at the same time supremely open-minded, setting thereby and example of incomparable modesty and tolerance."

This means that the scientist can no longer lay claim to the whole truth. There are other forms of understanding. This situation had to exist before scientists, professionals, administrators and politicians could collaborate in relations of mutual respect. It is a necessary condition for a positive science policy.

Next, the advent of open system and information theory in biology upset the principle of reductionism. Other options than physical models are now available to explain the 'living'. Moreover, these advances, being in themselves limited, are assisting the social sciences in further finding their own conceptual identity. All these steps are apprehended as being within science, which seems more self-consistent if less unified. Science, as an inquiring system,* has liberated itself from the domination of the physical sciences. As Sir Geoffrey Vickers has said of the distinctive domain of the social sciences:

"In the human species this responsiveness has become the basis for a further development so far-reaching that it needs to be distinguished as a third stage, because it introduces not only a new means of mediating change but even a new dimension in which change can be mediated. This new dimension is the conceptual system whereby humans represent, interpret, value, and increasingly create the world in which they effectively live. The new mediator is human communication, notably dialogue and the internal procedures which have developed with its use. The conceptual system thus developed is a psycho-social artifact, of which the conceptual world created by science, with its attendant procedures, is the most stable, coherent, and explicit example. But business, politics, and other human activities have their own partly autonomous systems; and in each individual from birth to death is to be found, in self-directing

and self-limiting development, an individual system as unique as his genetic code but containing initially far more possibilities than can be realized. These developments, individual and social, know springs and forms of change which have no counterpart in the purely responsible organization of other creatures. I will label the new mediator of change 'appreciation'."

Science, it would seem, can come to homo sapiens without disestablishing him from his human estate. The scientist need no longer be feared as necessarily advocating the wrong "design principle" as Emery* has called it. Emery's exposition of difference between the principles of the "redundancy of parts" (the inanimate model) and the "redundancy of function" (the animate model) is given in section III of the Supplement. Only the second can avoid an Orwellian world.

The appearance of an integrative strategy has shown that science has become able to cope with the reality of wholeness as well as that of elements. So long as it seemed to insist that only elements were real it did violence to a "truth" intuitively grasped in human experience. The integrative strategy has emerged in terms of the "systems" concept. Ross Ashby** gives the following account:

"Until recently the strategy of the sciences has been largely that of analysis. The units have been found, their properties studied, and then, somewhat as an afterthought, some attempt has been made to study them in combined action. But this study of synthesis has often made little progress and does not usually occupy a prominent place in scientific knowledge.

"The rule 'analyse into parts, and study them one at a time' was so widely followed that there was some danger of its degenerating into a dogma; and the rule was often regarded as the touchstone of what was properly scientific.

"Perhaps the first worker to face squarely up to the fact that not all systems allow this analysis into single parts was Sir Ronald Fisher. His problem was to get information about how the complex

* C. West Churchman et al. *Experiments on Inquiring Systems*, Report of the Social Sciences Group, Space Sciences Laboratory, University of California, 1967.

* F. E. Emery, "The Next Thirty Years: Concepts, Methods and Anticipations," *Human Relations*, 20, 3 (1967).

** Ross Ashby, "General Systems as a New Discipline", in *General Systems Yearbook*, 1968.

system of soil and plants would react to fertilizers by giving crops. One method of study is to analyse plant and soil into a host of little physical and chemical sub-systems, get to know each sub-system individually, and then predict how the combined whole would respond. He decided that this method would be far too slow, and that the information he wanted would be obtained by treating soil and plant as a complex whole. So he proceeded to conduct experiments in which the variables were not altered one at a time.

"At first, scientists were shocked; but second thoughts have convinced us that his methods were sound. Thus Fisher initiated a new scientific strategy. Faced with a system of great complexity, he accepted the complexity as an essential, a non-ignorable property; and showed how worthwhile information could be obtained from it. He also showed that this could be done only if the worker accepted the need for a new scientific strategy.

"What I have said is, of course, equivalent to saying that whereas physics and chemistry, given a system, promptly breaks it to pieces in order to study the parts, there is arising a new discipline that studies the system without breaking it to pieces. The internal interactions are left intact, and the system is, in the well known words, studied as a whole."

Russell Ackoff* adds:

"In the last two decades we have witnessed the emergence of the 'system' as a key concept in scientific research. Systems, of course, have been studied for centuries, but something new has been added. Until recently scientists and engineers tended to treat systems as complexes whose output could be expressed as a simple function of the outputs of the component parts. As a consequence, systems were designed from the inside out. Increasingly researchers have come to deal with systems whose output cannot be expressed as a simple function of component outputs and it has become more productive to treat them holistically and to design them from the outside in."

The systems concept has had a double origin, for it arose in "systems engineering" as

well as in theoretical biology. The sharing of a common concept has enabled pure and applied science to merge their activities in a way not previously possible. Disciplines of a new kind have arisen, such as operations research (sometimes called "system analysis") which deal directly with technological and social systems in the complexity in which they exist. This is a capability which science did not have at an earlier period. It has greatly increased its usefulness to those concerned with the management of human affairs just as the other advances mentioned have reduced the likelihood of its leading them into error.

New Concepts of Policy

If science has been changing so has policy. While the former has become more policy-aware the latter has become more science-aware. They have become "directly correlated"* in response to the increased uncertainties and interdependencies of the contemporary environment. These have had two effects on policy-making which have made it seek to become more "science-based":

- (i) the greater uncertainty requires more future-orientation;
- (ii) the greater interdependence requires more comprehensiveness.

When the change-rate was slower, policy could be largely corrective, acting after the event. With a faster change-rate, it has had to become more anticipatory, acting before the event. This relates it to planning. The task of government now extends from regulating the present to creating the enabling conditions for the future. This entails deciding which resources to commit ahead in what proportions so that this future may take place in one of the more desirable of its alternative forms. Such a task cannot be carried out without an extensive information base which can only be brought into being and maintained through the use of a wide range of sciences. Moreover, this task continuously challenges these sciences to develop new concepts and methods.

An account of what is involved is given in the last section of Part I of the Supplement with special reference to the economic and social fields. The first requirement is a more informed picture of the present, that state of

* Russell Ackoff, "Games, Decisions and Organizations," in *General Systems Yearbook*, 1959.

* For the concept of directive correlation see G. Sommerhof, *Analytical Biology* (London: Oxford University Press, 1950).

which becomes more unknown the faster and more uneven the change-rate. Disaggregated as well as aggregated statistics and indicators are needed for short-run projections, the identification of high risk areas and the separation of the least from the most changing parts of the society. Beyond this, techniques have to be developed for detecting and interpreting emergent social processes and for constructing models of alternative futures.

When the sub systems of society were less interdependent, policies could be more discrete and separate agencies could administer their own programmes with minimum reference to each other. The greater degree of interdependence has changed this situation. Diffuse problems now arise affecting several sections or indeed the whole of a society and these problems tend themselves to be interconnected. Examples would be poverty, obsolescence, urban decay, pollution, regional disparity, water and other natural resource management. Michel Chevalier* has called these "meta-problems". His analysis is presented in Part I of the Supplement. The causes and boundaries of these problems cannot be established without research.

The implications for policy have been stated, with reference to the United States, by Lawrence Frank:**

"The Federal Government now provides a wide range of professional and technical assistance, with many direct subsidies and special tax allowances and concessions to business, finance, industry, transportation, and communication—indeed, to the whole range of free enterprise. This assistance to private business has been explained and justified as promoting prosperity and advancing the national welfare. But assistance and services to individuals and families have been strongly resisted and only reluctantly provided since there is no adequate rationalization for such extensions of government activities. The need for a political theory for this emerging "Service State" is, therefore, especially urgent.

"The Service State, not to be confused with the Welfare State with its aura of

charity and philanthropy, is oriented to the enhanced "well-being" of everyone, as Halbert Dunn has expressed it. It marks the acceptance of human conservation as the basic democratic task; each year sees the enlargement and extension of services furnished directly or financed by the Federal Government and reinforced by state and local agencies. These services embrace medical and health care, improved housing and urban rehabilitation, educational facilities and programs from early childhood into adult years, plus the improved care and support of the indigent, the handicapped, the impaired, and all others incapable of fending for themselves in our money economy.

"Each addition and enlargement is made as a separate program with no coherent and systematic commitment, no political theory to justify and rationalize these enlarged government activities, and no statement of policy for their extension and administration. We are improvising and operating by a series of piece-meal programs.

"This implies the need for an over-all, comprehensive policy that will assert the criteria for choices and decisions. With a clear statement of policy, those who make social decisions can be guided, as if by 'an unseen hand' when exercising their autonomy to integrate their efforts by collaborating with others who are responsive to these same criteria. Without a statement of basic criteria for national policies, the various specialized programs and the separately located authority of governments and private agencies will continue to plan and execute their separate and often irreconcilable programs."

This orientation makes it apparent that we are moving towards another type of society than that to which we have been accustomed. This is often referred to as post-industrialism.* There is, however, no guarantee of our safe arrival. Not only are the interdependencies greater—they are differently structured. Frank points out the value-confusion over welfare but does not bring out its changing relation to development. An analysis of this, in system terms, is presented in Part II

* M. Chevalier, "Stimulation of Needed Social Science Research for Canadian Water Resource Problems," Privy Council Science Secretariat, Ottawa, 1967.

** Lawrence Frank, "The Need for a New Political Theory," *Daedalus*, 96, 3 (1967).

* Daniel Bell, "Notes on the Post-Industrial Society (I & II)," *The Public Interest*, Nos. 6 & 7, 1967.

of the Supplement. Research by the social or whatever group of sciences is most appropriate is needed on all such problems. The changes in the policy field demand a new mobilization of the sciences. This could not be effected had not the changes in science itself which were described in the previous section taken place.

Problem-Oriented Research Domains

The changed relationship of science and policy and the changes that have been taking place in each have led to the emergence of a new type of scientific activity. This still tends to be confused with more familiar types and needs spelling out. The spectrum of scientific activities has usually been thought of as including fundamental or basic research, applied research and development work. The economists have recently added another term: innovation. This refers to the additional activities that must be undertaken before the benefits of R & D can be realized in goods and services effective in the market place. The concept of innovation is also applicable to the non-market sector as will be shown in the last section of this paper. If the ends of the spectrum are now clearer there is something blurred in the middle. For some time the term "problem-oriented research" has been struggling into existence not knowing whether it should be subsumed under applied research or represent something different. I will attempt to show that it comprises a distinct category whose recognition has central importance for science policy and its social aspects.

If fundamental research is discipline-based, problem-oriented research may be said to be domain-based. A domain of inquiry links a group of sciences to a major sector of social concern. The problems are generic rather than specific. They may be said to constitute meta-problems. They require on-going endeavour leading to cumulations of findings rather than "solutions". These findings contribute simultaneously to the advancement of knowledge and to human betterment. The development of a domain is jointly determined by the social and scientific interests concerned. From the policy standpoint such a domain has the characteristics of future-orientation and comprehensiveness. On the scientific side it involves the integrative strategy. Disciplines across the entire range of the physical, biological and social sciences tend to be drawn in. Their weighting and salience, however, vary enormously between domains, which have very different centres and evolve very different configurations. Sci-

entists, professionals, administrators and political representatives all become involved. Yet the texture of their relationships differs from what it is in fundamental research, where scientific interest dominates, or applied research, where user-interest dominates. The relations of the different types of actor in a problem-oriented domain is that of collaboration. Bound together by common commitment to the overriding purpose they have to recognize the complementarity of their contributions and respect each other's authority. Novel problems of decision-making and mutual responsibility are posed which are neither fully understood nor always well worked out.

Domain-based problem-oriented research has experienced difficulties not only in securing recognition as a distinct activity but in finding appropriate organizational settings. This is scarcely surprising since it represents the confluence of key emergent trends in both science and policy. The following account by Don K Price* of the struggles of oceanography to acquire a suitable home among the agencies of the United States government will illustrate.

"Oceanography was the first large-scale federal scientific program. It began when Thomas Jefferson founded the Coast Survey in 1807 and employed a Swiss scientist, Ferdinand R. Hassler, to bring scientific instruments from Europe and begin the job of charting the seas for the guidance of navigators. Oceanography is a field of basic and applied science in which a great many federal departments and agencies have long been involved. But, for purposes of my story, the contemporary oceanographic program began in 1956, when a group of government oceanographers decided that their activities needed to be greatly built up. Indeed, the part of the story that I propose to tell begins in March 1961 when President Kennedy included an expanded oceanographic program in his first budget, and it ends twenty months later when he pocket-vetoed the Oceanography Act of 1962.

"An idea of the scope of the expanded program is given by the various reports and testimony presented to Congressional committees. At least fourteen operating

* Don K. Price, *The Scientific Estates* (Cambridge: Harvard University Press, 1965).

agencies were concerned, as well as the staff agencies in the Executive Office of the President.

"The Navy, which had already revolutionized its strategic doctrine by developing the Polaris submarine and missile system, wanted more knowledge of currents and other ocean phenomena, both to increase its offensive capabilities and to defend against enemy submarines and their missiles.

"The Geological Survey had its eye on the offshore oil on the continental shelf, and the Bureau of Mines on the promise of vast mineral resources in the ocean depths.

"The Bureau of Commercial Fisheries was intrigued by the possibilities of increased protein supplies and even new kinds of food for an overpopulated planet. The Bureau of Sport Fisheries and Wildlife hoped to develop new recreational opportunities.

"Medical researchers talked with excitement about the search in the oceans for new biological compounds that might give clues to the biochemistry of sanity and insanity—might even provide a clue for cancer. The Public Health Service, though it soft-pedaled such speculation, was concerned about pollution of our sea-foods and our beaches and harbours by sewage and chemical wastes, as was the Atomic Energy Commission about the disposal of nuclear wastes.

"Several agencies were interested in oceanographic research because of their roles in aiding navigation. The Coast and Geodetic Survey has the job of mapping the shores and currents; the Weather Bureau makes forecasts; the Corps of Engineers maintains harbours; and the Coast Guard keeps the sea lanes clear of dangers to shipping.

"Finally, there were the established research and development programs. The Maritime Administration carries on studies to adjust the design of ships to oceanic conditions; the Smithsonian Institution conducts basic research; the National Science Foundation and other agencies make grants to universities and other institutions for a wide variety of investigation relating to the oceans.

"The advocates of a comprehensive federal program knew that they were deal-

ing not merely with a field of science, but a major problem in government organization. As Harrison Brown, chairman of the Committee on Oceanography of the National Academy of Sciences, told a Senate committee in 1960, the decision to be made on the organization of the oceanography program 'far transcends oceanography itself'. He noted that the undertaking because of the way in which it cut across the programs of many operating agencies, typified the 'problem of decision making, concerning science and technology in Government.'"

No systematic attempt has yet been made to describe problem-oriented research in terms of the domain concept or to relate such domains to the discipline-based fields of fundamental research or the user-prescribed missions of applied research. Obviously, one type of work can give rise to the others. If the overall scientific enterprise were to be mapped in domain terms, fundamental and applied work would be included, where relevant, under domain headings. The Table below is a trial exercise in this direction.*

Problem-Oriented Research Domains

<u>Domain</u>	<u>Notes</u>
Medicine	Biological sciences related to medicine; biomedical engineering; clinical and epidemiological studies, including psychological and social aspects; appraisals of health care systems and services.
Agriculture	Agricultural sciences and technology; the rural economy; psycho-social studies of the changing rural society.
Natural Resources	Conservation; recreation; earth sciences; oceanography.
Space	Relevant sciences and technology; uses of space.
Human Resources	The development and deployment of the individual educationally, vocationally, etc.; the educational and employment and career systems and their linkages at all phases of the life cycle; relation to leisure.

* Expanded from Table 5 in *Social Research and a National Policy for Science*, Council of the Tavistock Institute of Human Relations, Tavistock Pamphlet No. 7, 1964.

Domain	Notes
Family and Household	Relating the biological, psychological and sociological aspects with those of the economic and material environment.
Community and Regional	Similar aspects at the community level of analysis, whether urban or rural, local or regional; the concept of the 'built environment'—the relation of physical to social planning.
Law and Society	Linking legal, sociological and psychological studies of social regulation in all fields; legislation, courts, police, offenders, prisons, and rehabilitation, etc.; civil, industrial, matrimonial law, etc.
Technology and Industry	Several sub-domains would be required; type of technology giving one possible basis, but technological considered in relation to economic, market, organizational, and human aspects.
A	constructional
B	mechanical, automotive
C	electrical
D	chemical
E	electronic
F	nuclear
Developing Countries	Cultural, racial, economic problems, etc.
Advanced Countries	Including the whole range of 'international studies': political, legal, economic, cultural, technological, organizational, etc.

Such a listing may serve to disclose the multiplicity and pervasiveness of problem-oriented research domains in the scientific enterprise of a modern society. Britain is the reference country in what follows. The most clearly identifiable and most commonly recognized items are in the first group centred on the biological and physical sciences, medicine and agriculture being the time-honoured members. Natural resources are only beginning to be regarded as a comprehensive domain. Space is sometimes perceived as a domain, sometimes as a series of missions. The next group, centred on the social sciences, is the least recognized; many alternative bases of conceptualization would be proposed. The "appreciations" in this area are

neither well developed nor in agreement. The industrial list would give rise to questions of how much should be financed by industry or by government, and what carried out where. Competing views would disclose the extent to which the boundaries and roles of the public and private sectors remain unsettled. Only with respect to the last group, concerned with improving knowledge and understanding of other countries, would an apperceptive consensus reappear, but there would now be wide differences as to the degree of importance to be ascribed.

A first annotation has shown that the relationship between science and society expressed in a problem-oriented research domain is a sensitive indicator of the prevailing value system. A scrutiny in terms of resource allocation would confirm this. But the list is incomplete. The area which has consumed more scientific resources than any other among the nations on the winning side in World War II has been left out: defence. This is the area which gave rise to the concept of mission. One may ask how far defence research is domain rather than mission-oriented. Less, perhaps, than one might be inclined to assume. One may ask also how far defence has dominated the whole field in concept as well as in resource consumption.

Despite the ambiguities revealed, there is accumulating evidence that field-determined, generic, problem-oriented research expresses the critical relation between science and society in the transition to post-industrialism. This appears to be so in Eastern European countries as well as in the West. A comparison of Czechoslovakia and France will illustrate, with special reference to the social sciences.

In Czechoslovakia a state plan for scientific research 1961-5 was worked out by the Academy of Sciences, the State Commission for the Development and Coordination of Science and Technology (SCDCST), the State Planning Commission and the Ministry of Finance.* The plan was presented in terms of sixteen "complex projects", some of which represent directions of basic research, while others are problem-oriented. Each complex project was divided into a number of "fundamental projects", of which there were 95—in turn divided into "main problems", of which

* UNESCO Science Policy Division, *Science Policy and Organization of Scientific Research in the Czechoslovak Socialist Republic*, UNESCO Paris, 1965.

there were 370. These constitute the basic planning units. Work on a main problem is shared by several research establishments, each of which tackles a "partial problem". For each complex project a "collegium" of 8-10 members is appointed, which is the appropriate collegium of the Academy if the project is in an area of basic research. Otherwise, a new collegium is created. If the project is more technological than scientific, the collegium will be responsible to the SCDCS, though it may still be headed by an academician. Its members include chairmen of its fundamental projects and others drawn from appropriate academic, administrative and political fields. The collegium sees that the political, economic and cultural objectives of the plan are attained and appraises overall performance. For each fundamental project there is a more expert body to evaluate and improve the quality of solution of the main problems comprising the fundamental project. It endeavours to keep these in step. For each main problem a co-ordinator links the establishments concerned with its execution and the council of the fundamental project.

Of the sixteen complex projects in the 1961-5 plan three are centred on the social sciences:

(a) *The role of schools and education in the "transition from socialism to communism"* (equivalent of the transition from industrialism to post-industrialism):—fundamental research in the psychology of learning and the sociology of education; a philosophical and sociological analysis of educational theory; problem-oriented research into methods of instruction and curricula design; and on the relationship of education, training and occupations, including studies of the biological and physiological aspects of work.

(b) *Conditions affecting the performance of the economy during the transition*:—a variety of projects in theoretical, institutional and applied economics; work in industrial sociology and organization theory; a component concerned with the social function of science.

(c) *Social and cultural change during the transition*:—a mix of sociological, political and philosophical studies with contributions from history and ethnology.

In addition, several of the other complex projects involve the social sciences in collaboration with the biological or physical sciences:

(a) *The healthy development of new generations*:—ecological and social factors in physical and mental development, with attention to the psychiatric aspect.

(b) *Nature conservation and health of natural environments*:—a co-operative effort between urbanists, technologists, biologists, sociologists and economists.

(c) *Improved material and cultural standards* through the greater social effectiveness of capital investments:—studies in building economics, town planning, etc.; and an analysis of cost-benefit criteria.

(d) *The automation of complex systems*:—fundamental work on information theory and its application to the social sciences, as well as the social and psychological consequences of automation.

The generic field-determined nature of these projects compels inter-disciplinary collaboration first among the social sciences and then between them and the biological and physical sciences.

In France a more explicit social science policy is in operation under the V^e Plan than elsewhere in Western Europe.* The objectives, priorities and instrumentalities of a strategic program for accelerating the development and application of the social sciences have been systematically worked out and implementation begun. The overriding objective is to build up a comprehensive understanding of the totality of factors affecting economic and social development—psychological, sociological and biological as well as economic and technological. The posture is multidisciplinary and problem-oriented. The aim is to provide a social science capability which will influence national policy. This cannot be done, as the planners see it, by narrowly conceived short-term projects but by thematically conceived and broadly coordinated long-range programmes. The priorities can only be established in the action frame of reference.

Four principal "orientational" themes have been selected and several programme areas identified in each:

(a) Under *processes of economic and social development* one programme will

* Délégation Générale à la Recherche Scientifique et Technique, (DGRST). Rapport du Groupe «Sciences Humaines» de la Commission de la Recherche, Préparation du V^e Plan, D.G.R.S.T., Paris, 1965.

examine the conditions and consequences of technical innovation and another will consider the relation of standards of living to ways of life. A third will be concerned with the administrative capabilities which facilitate development, and a fourth with urban and regional problems.

(b) The *development of human resources* includes one broad programme area in manpower studies and another on psycho-social aspects.

(c) *Education* is given major emphasis with programmes in learning and motivation; new teaching methods; curriculum content in relation to the obsolescence of knowledge; and the training of future teachers.

(d) The *mutual understanding of societies* is concerned with problems of communication by all methods and media and at all levels of human interaction; also with the conditions of socio-cultural 'equilibrium' and 'disequilibrium'.

To balance this total programme is another concerned with 'free' fundamental research. This is centred on the humanities rather than the social sciences though logic and mathematics are singled out. Additional are the "Actions Concertées". The first of these is an intensive study of R & D establishments. Others are on programmed learning and the use of space in cities. Finally, there is a scheme for examining neglected aspects of communication and adaptation in groups undergoing changes in life-style through technical and economic development.

In recommending how all this is to be put into effect, the DGRST laid stress on bringing into being special centres in user-organizations, particularly government departments, with the double function of coordinating the projects undertaken and relating the research workers to the executives. The key centre would be set up in the office of the Prime Minister, at the elbow of the Commissariat Général du Plan, under the title of the Centre de Coordination d'Orientation des Recherches sur le Développement Économique et Social (CCORDES).

Social and technical development and innovation

The counterpart at the more concrete level of the fusion of social and scientific interests in a problem-oriented research domain is the action-research programme or project carried

out by a research group in collaboration with a client system. The client system may be an industrial firm, a public agency in any field or a wider authority embracing a large number of these. The research group may contain any mix of disciplines—whatever is appropriate to the task in hand.

The strategic significance of this type of work derives from the extent to which new institutions have to be built and old ones renewed during a time of social transition as great as the present. Government now intervenes in the operations of society to an extent previously unknown. New Schemes need piloting up; their operations monitoring and evaluating. There is a growing demand in the field of social action for an equivalent to industrial development work and also of product innovation in the sense of the diffusion of a proven pilot throughout the wider system intended. Much of such work is technological as well as social, i.e. socio-technical in the sense of the concept originally introduced in the Tavistock studies of the British mining industry.* It involves design.

The theory of the collaborative relationship and of the practical engagement of social science as a strategy for advancing the base of fundamental knowledge is summarized in Part IV of the Supplement. To proceed in this way releases processes of social and organizational learning which permit innovations to be accepted an adaptive changes to take place which would not otherwise be possible. I will illustrate from projects of which I have personal experience.

The action-research group with which I was associated in the British Army during World War II, and which later founded the Tavistock Institute, developed a form of operational field psychiatry—a sort of psycho-social equivalent of operational research. As the tasks undertaken became more complex psychologists, sociologists and anthropologists were added to the team. Interdisciplinary collaboration was achieved in an action frame of reference. The method developed had depended in the first place on a free search of the military environment to discover points of relevant engagement. The 'right' had then to be 'earned' to have a critical problem which could not be met by customary military methods referred to the technical team for

* E. L. Trist et al. *Organizational Choice: Capabilities of Groups at the Coal Face under Changing Technologies* (London: Tavistock Publications, 1963).

investigation and appreciation. This appreciation would next be discussed with appropriate regimental personnel and a likely countervailing strategy jointly worked out. The feasibility and acceptability of the plan evolved as well as its technical efficacy would be tested in a pilot scheme under protected conditions and technical control. As the pilot proved itself the scheme would become operational, control being handed back to regimental personnel, the technical team 'retreating' to advisory roles^{*} or removing their presence entirely except for purposes of monitoring and follow-up. What was learned was how to take the collaborative role in innovating special purpose service organizations with built-in social science capability in a large multi-organization of which the social science professionals were themselves temporary members—the army—under conditions of war.

A brief but comprehensive account of the many different types of activity undertaken was published at the time^{*}. One of the most instructive, from the point of view of engagement with large-scale social systems, was that concerned with the civil resettlement of repatriated prisoners of war. For this purpose twenty transitional communities, designed on data contributed by the repatriates themselves, from their own experience, were brought into existence, run very largely by specially trained regimental personnel. There were never more than two or three psychiatrists in the whole organization. There were equally small numbers of psychologists and sociologists. Looking back on this experience, what impresses me most is not so much the development and maintenance of the transitional communities themselves, which followed on from the two Northfield Experiments^{**} as the enormous scale of the effort that had to be made towards the environment, both military and civilian. Without this the necessary sanctioning decisions at the highest level of government would never have been obtained; the repatriates themselves would never have been convinced that the scheme was worthwhile and volunteered to attend Civil Resettlement Units in large numbers; and the participation of some four thousand

civilian organizations, especially industrial firms—a quite crucial factor—would never have been obtained.^{***}

A recent example is a project on communications in the British building industry begun in 1963 as a joint undertaking of the Human Resources Centre of the Tavistock and a newly founded Institute for Operational Research.^{****} The initial relationship was with the National Joint Consultative Council of the Royal Institute of British Architects, the Royal Institute of Chartered Surveyors and the National Federation of Building Trade Employers, to whom the problem had been brought through a resolution having been passed in one of its own branches. The Council then approached the Institute, having decided that the problem was one which required social research whose relevance to its needs it had already begun to explore. A small steering committee was set up to work closely with the research team during the pilot phase of the project. In the course of their joint meetings the idea was conceived of reporting back the initial findings to a residential conference, designed on small group principles, convened by the Council and attended by some 80 key influentials from all sections of the industry, the professions connected with it, and the trade unions and government departments concerned. This event took place some six months after the inception of the pilot phase and was the first occasion on which a comprehensive gathering of those having to do with the industry had taken place—its basis being far wider than the Council itself.

The conference, held in a Cambridge College, committed itself unanimously not only to further support of the particular project in question but to take the first steps towards setting up an industrywide research institution to promote a variety of projects in an industry notable for its lack of research interest and now facing rapid technological change and growing crisis in its relation with society. Trustees were appointed and a

^{*} J. R. Rees, *The Shaping of Psychiatry by War* (New York: Norton, 1945).

^{**} W. R. Bion and J. Rickman, "Intra-Group Tensions in Therapy," *Lancet* ii (Nov. 1943), and H. Bridger, "The Northfield Experiment," *Bulletin of the Menninger Clinic*, 10, 1946.

^{***} A. T. M. Wilson, E. L. Trist and A. Curle, "Transitional Communities and Social Reconnection: A Study of the Civil Resettlement of British Prisoners of War," in G. E. Swanson, et al., eds, *Readings in Social Psychology*, 2nd edition, (New York: Holt, 1952).

^{****} G. W. Higgin and W. N. Jessop, *Communications in the Building Industry* (London: Tavistock Publications, 1963), and C. Chrichton, Ed., *Interdependence and Uncertainty*, (London, Tavistock Publications, 1966.)

considerable sum of money raised. A representative research committee was brought into existence which in turn delegated certain of its members to work closely with the research team. In such a steering group key problems can be identified and likely emotional reactions experienced under protected conditions.

Some eighteen months later the pattern of forces in the wider environment had changed in ways that could not have been anticipated, partly by actions of the outgoing government, partly by uncertainties created by the incoming government and partly by changes in the general economic situation. The committee lost any sense of a relationship with a potential comprehensive support base and the trustees felt unable to raise additional funds. The resulting anxieties and conflicts were 'worked through' in the small group composed of the leaders of the research team and the steering committee so that damage was averted to the long-range institution building aims—the strengthening of the industry's general research capability and the development through this of greater powers to collaborate among its conflicting and dissociated interest groups. A 'realization' report was produced of what had been done so far, a shortened version of which the Committee published with a restatement of the aims of the Cambridge Conference. The circulation of both this and the report on the pilot phase have been unusually large, overseas as well as in the U.K. while one or two small project activities have continued on Government research funds, some wider impact has also been made. Moreover, the options have been left open for a joint search to be undertaken to find a new basis for continuing the innovative concept which represented the commitment of the Cambridge Conference.

A further example is the Industrial Democracy project in Norway* which has now been proceeding for some seven years as a collaborative enterprise between the Norwegian Confederations of Employers and Trade Unions and the Trondheim Institute of Industrial and Social Research and the Human Resources Centre of the Tavistock Institute. At a later stage the Norwegian Government joined the consortium of sponsors while the Trondheim Institute had to set up a new cen-

tre in Oslo and the socio-technical group at the Graduate School of Business Administration of the University of California, Los Angeles, has also been drawn in. As with the Building Project this project has required a sustained effort in institution building so that every step would be sanctioned not only by those directly concerned but by those potentially concerned.

The problem arose because of a sudden increase in the Norwegian trade unions of a demand for workers' representation on boards of management. What is remarkable is that the two Confederations should have requested the assistance of social scientists in order to gain a better understanding of what would ordinarily have been treated as a political problem. A thorough analysis of the economic, cultural and political features of Norwegian society was necessary as a background. Since the Norwegians needed to relate themselves to the experience of other countries it is doubtful if a solely Norwegian team would have been credible, but it is certain that a foreign team would not have been acceptable except in relation to a Norwegian Institute which had earned the right to be trusted with such an explosive problem.

The first phase of the project involved a field study of the main enterprises in Norway which included workers' representatives on their boards. The findings, having been reported back to the joint steering committee set up by the sponsors, were widely discussed not only throughout the two Confederations but in the press. The redefinition of the problem obtained in the first phase set the stage for the second which has been concerned with securing through socio-technical experiments, improved conditions for personal participation as "a different and perhaps more important basis for democratization of the work place than the formal systems of representation". The third phase, recently begun, is concerned with the diffusion of organizational earnings from these experiments.

Since this diffusion would be mediated through consulting engineers into the bulk of Norwegian industry which consists of small firms it was necessary to find a means of entering the consulting engineering system—through an engineer who had found his own way to a socio-technical approach—Dr. Louis Davis of UCLA. Moreover, the diffusion process has been assisted both in Norway and other countries where similar socio-technical

* E. Thorsrud and F. E. Emery, "Industrial Conflict and 'Industrial Democracy'," in *Operational Research and the Social Sciences*, ed., J. R. Lawrence (London: Tavistock Publications, 1966).

innovations are now proceeding (Sweden, Eire, and the U.K.) by arranging an interchange of visits by managers and shop-stewards of the firms concerned and also by officials of the relevant trade unions.

The idea of applying the methods of science to social development and innovation is now spreading in a number of different contexts, though it still encounters profound resistance. Russell Ackoff has summed up the position as follows:

"In the democratic societies with which I am familiar, there is almost an innate abhorrence of social and economic experimentation. We think it demeans the subjects and threatens with the possibility of excessive public control of private lives. Yet, curiously enough, no other type of society manipulates and varies the form and content of its control over its members as much as a democratic one. Democratic nations constantly change taxes, tariffs, interest rates, zoning rules, laws, regulations, transportation and communication systems, metrics and even the clock. The major aspects of experimentation—manipulation and control—are already widely practised in such societies. They even attempt to measure the effects of changes in public policy on national performance. But here is the rub: they usually do not let the design of the evaluative procedure affect the way the public is controlled or manipulated. The evaluators are called in *after the fact*, when it is too late to do an adequate job of evaluation and when the possibilities of gaining understanding are almost completely destroyed. For example, in industry we have found that no amount of retrospective analysis of advertising and sales can yield as much understanding of their relationship as can even a very simple experiment in a few market-places.

"In the United States we have just missed a marvellous opportunity to perform useful experimentations in connexion with our so-called "Poverty Programme". Instead of designing these programmes as experiments to inform us how to reduce or remove poverty, we assumed we knew the answers. Only when the failure of such programmes was obvious was any effort made to determine what their effect had been. By then it

was too late. Instead of changing our methodology we have only changed our programmes. There is little consolation in knowing that we won't make the same errors twice.

"Science and other subsystems of our nation-system must become the subject of experimental study...If experimental designs are used as a basis for the allocation of national resources to science and technology, feedback can lead to adaptation, and gradually improving policy making can be expected while basic understanding of science, if not the nation, is being accumulated."*

The increasingly unregulable world which science has been bringing into existence can best be brought back into a more regulated state by applying the methods of science to the change processes occurring within it. This entails engaging in social or operational experiments of many different kinds but always sanctioned by those concerned. In this way errors and unintended effects are more likely to be picked up before it is too late. So far as all participate all will learn and the values of science will be diffused into the society which will itself embody the social aspects of its science policies.

Supplement to SOCIAL ASPECTS OF SCIENCE POLICY

Eric Trist

I. Analysis of the Contemporary Environment (modified from the author's contribution to "Appraising Administrative Capability in Development", a methodological monograph prepared by Interplan for the Public Administration Division, United Nations, 1969)

II. Systems Aspects of Welfare and Development (from the author's paper "The Relation of Welfare and Development in the Transition to Post-Industrialism", prepared for the Seminar sponsored by the Canadian Centre for Community Studies, 1967).

III. An Active Role for the Social Sciences and Choosing a Design Principle in Relation to Values (from F. E. Emery, "The Next Thirty Years: Concepts, Methods and Anticipations", *Human Relations*, 20, 3, 1967).

* Russell Ackoff, "Operational Research and National Science Policy," in *Decision Making in National Science Policy*, ed. Anthony de Reuck (London: Churchill, 1968).

IV. The Search for a Policy for the Social Sciences (concluding section of the author's report to Unesco on the Organization and Financing of Social Research. Restricted until publication in "Main Trends of Research in the Sciences of Man", Unesco, Paris, 1969).

Supplement to
SOCIAL ASPECTS OF
SCIENCE POLICY

Eric Trist

I. *Analysis of the Contemporary
Environment*

The Task Environment

It is necessary to distinguish between the immediate operational or *task* environment and the more remote, general or *contextual* environment. The task environment consists of all organizations, groups and people with whom the organization has specific relations, both on the input and output sides, even though it may not be aware of their complete range. The contextual environment consists of the relations which the entities included in the task environment have to each other and to other systems not directly entering the world of the organization's own transactions. Events in the contextual environment may at any time obtrude into this world, constructively or destructively, predictably or unpredictably.

The task environment of an organization (or larger system) includes the complex array of government groups, private organizations, ethnic minorities, voluntary associations and miscellaneous publics that serve as its clients and suppliers, controllers and controllees, supporters or adversaries. It may also include foreign clients and suppliers, lenders, investors and donors, large and small power blocs and their organizers and transnational organizations. Even when the agency and country are small, the task environment is large.

To be able to deal with great environmental complexity is as important an element in administrative capability as any other. Yet it is one of the most neglected and one also of the most difficult to improve. Typical weaknesses in agencies involved in development programmes are hostilities or communication gaps between them and

(a) various private, cooperative or other non-governmental sectors,

(b) community leaders throughout the country, regional and local as well as national.

(c) the interests and desires of unorganized people, many of which they cannot articulate.

The scale of the effort required to develop these relations is substantial. It is usually under-estimated. These relations must also be actively and continuously maintained. This too often is not realized. Coercion does not succeed except in the short run under crisis conditions. There is no substitute for building wide-spread, enduring support in the task environment. This means a big investment of resources, and thorough examination of the opportunity costs involved, political and human as well as economic.

In nations with mixed economies plan-implementation organizations must include means for enlisting the cooperation of the private sector. In all economies, improved capabilities are required on the part of both national leaders and civil servants for developing widespread participation in plan formulation. This is easy to say but difficult to achieve. It is costly, time-consuming and trying of patience. Temptations to take short cuts are at the elbow of my administrator. The chief gain from widespread participation is that we get an idea, otherwise unobtainable, of the acceptability—and hence the "implementability"—of programmes. To be acceptable to the population concerned, a programme must be intelligible in terms of its needs, goals, values and habits of thought. Otherwise any proposed change or innovation will mystify and confuse; so threaten; and so cause either opposition or disengagement.

So if plans are to be implemented, their objectives and attainability as 'formulated' must be perceived and accepted as 'right' and as 'for real' by the key individuals, main interest groups and publics concerned in their implementation; and the experience of those concerned must be seen by them to have 'effects'—namely, it must be taken into account in modifying the plans as originally formulated and in framing new plans. Otherwise, those concerned cannot be expected to develop any deep commitment to the plans they are supposed to implement and make work as an integral part of the new round of their everyday lives.

The Contextual Environment

The state of the relations between the contextual environment, the task environment and the internal world of the organization has

constantly to be borne in mind by the administrator. He must distinguish between:—

(a) processes that go on within the organization—the area of internal interdependencies—such as interdepartmental conflicts, status problems, organizational dilemmas, morale or efficiency problems.

(b) the exchanges between the organization and its task environment—the area of transactional interdependencies, from either the input or the output direction—the type of problem discussed in the preceding section.

(c) processes through which parts of the environment become related to each other, constituting what may be called its *causal texture**—the area of interdependencies that belong within the environment itself. These processes are contextual, i.e., ecological.** They involve characteristics of and forces in the wider society.

The processes which connect parts of the environment to each other are often unlike those connecting parts of the organization to each other, or even with those which relate the environment to the organization. A major fallacy has been to assume their identity.

An internally well-managed organization making a good product or rendering an excellent service does not just for these reasons succeed in the market place or continue to meet a salient need in the non-market sector. Nor for these reasons alone will its input requirements, human, financial or material, remain available to it in the accustomed quantities on the accustomed terms. Moreover, the contextual conditions determining its transactions may be affected by a wide range of factors. Though some of these may be foreseeable, others are difficult, still others impossible, to anticipate. We may instance a change of government, a change in the terms of trade, new legislation, a strike in another industry, a revolution in another country, a distant war, a period of increased financial uncertainty, a drought or other natural

disaster, a population explosion, a new medium such as television, an alternative technology, a change in the educational system or of policy in an international agency, or the attitudes of the oncoming generation, which may lead to shifts in values or fashion regarding the relation between traditional structure and modernization.

Since there is an accelerating and uneven change rate in the world generally and communications have become so explosively effective, the contextual environment is becoming more and more important for those who administer programmes in development planning. Future states of the administrator's own organization and its task environment are likely to be even more affected than ever by the wider societal field both national and transnational. The administrator must, therefore, equip himself with more information and new methods.

The contextual environment is international as well as national. Increasingly, events and trends have distant effects which are rapidly felt. The environment of national planners and their counterparts in operating agencies is characterized by the slow and painful emergence of a new world society. This world society is characterized by interdependent nations, world-spanning organizations, diffusing technologies, urban world centres and world-oriented elites. This growing interdependence is facilitated by increasingly rapid systems of communication and transport.

This same inter-dependence increasingly makes conflicts more likely while the more rapid means of communication make the spread of conflicts more likely. People all round the world now compare themselves with each other, especially those more privileged and advantageously placed. Expectations rise and the sense of relative deprivation grows.

Increased inter-dependence also creates countervailing tendencies toward separatism. A need is felt to ward off the contextual intrusions not only because of their increasing frequency but because they are only too apt to be alarmingly dissonant from the familiar and near. The rise in nationalism, and "sub-nationalism", may be accounted for in part by this. The multiplication of small nation-states and of separatist regions in larger states has already created severe problems for development administration. Attempts at federation have on the whole been discouraging. Devel-

* F. E. Emery and E. L. Trist, "The Causal Texture of Organizational Environments", *Human Relations*, 18, 1, 1965.

** Eric Trist, "The Relation of Welfare and Development in the Transition to Post-Industrialism", Western Management Sciences Institute, University of California, Los Angeles, 1968.

opment administrators must recognize the co-presence of opposite needs for autonomy and relatedness, bigness and smallness, traditionalism and modernism, and judge both their strength and degree of reality as they frame and execute policies and programmes.

Environmental Change: turbulence

The degree of change now taking place in the contemporary world as a whole is of an order as great as that which occurred when large-scale societies with written languages first arose on the basis of agricultural settlements. This ushered in what Kenneth Boulding* has referred to as the era of "civilization" which, having lasted some 5,000 years, is in his view beginning to give place to a new type of social order. Those who are developing the study of the future are at present attempting to explore possible forms which this new order might take. Since the "Futuribles" project of Bertrand de Jouvenel** began but a few years ago Institutes and Commissions concerned with the multidisciplinary study of the future have sprung up like mushrooms in almost all of the advanced countries—and in some of those which are less advanced. This is in itself evidence of the intensity of the current need to prepare for what lies ahead.

Noting that the most critical single change which occurred during the period of "civilization" was the transition from pre-industrial to industrial societies, Daniel Bell*** has won acceptance for the term "post-industrial society" to indicate the type of social order which would seem to be emerging. In post-industrialism the available technology will eventually be such that the production of economically required goods and services will no longer absorb most of the energies of most of the people. Though post-industrialism in a fully developed state is unlikely to be reached anywhere in the world for a considerable number of years, the existence of an irreversible trend in this direction is already powerfully affecting ever widening classes of events and larger masses of people, both consciously and unconsciously.

* Kenneth Boulding, *The Image*, University of Michigan Press, Ann Arbor, 1956.

** Bertrand de Jouvenel, *The Art of conjecture*, Basic Books, New York, 1962.

*** Daniel Bell, *Penguin Survey of the Social Sciences*, Penguin Books, London, 1965. The term was originally suggested by David Riesman, "Leisure and Work in Post Industrial Society", in *Mass Leisure*, Ed. E. Larrabee and R. Meyerson, Glencoe Free Press, 1958.

This trend is proceeding far more rapidly and far more unevenly than had been anticipated, within as well as between countries. If the gap between the developing and the developed countries is widening so is that between generations. In the most advanced countries, certain parts of the society are already in or approaching an early phase of post-industrialism, while many others remain in various phases of industrialism, and still others are pre-industrial. Under some conditions, these different parts are interspersed; under others they are separate. In many critical respects it is social scatter rather than social cohesion which is increasing.

With the means of communication now available (especially television), a diffuse consciousness of this total state of affairs is spreading, making reactions more rapid in both unstructured publics and organized interest groups, and altering the threshold of what people will tolerate. The problems created are of a type and on a scale which call more than ever for planned intervention. But too many of the attempts so far made have had poor success. Meanwhile, new forms of violence and estrangement are appearing. Whatever their differences, serious analysts of the contemporary scene show uncommon accord in thinking that the transition to post-industrialism is likely to be fraught with hazards as difficult to surmount as any yet encountered by man, both in the societies which first confront it and, through them, in the less developed parts of the world.

The difficulties arise because there is a continuous and accelerating, though uneven, change in the overall environment, deriving ultimately from advances in science and technology; and the advances in communication particularly make this evident to all humanity. The contemporary environment is more than ever in history a *turbulent field*.**** This turbulence arises from the increased complexity and size of the total environment together with the increased interdependence of its parts and the unpredictable connections which arise between them as a result of the accelerating but uneven change. This turbulence grossly increases the area of relevant uncertainty for individuals and organizations alike, and raises far-reaching problems concerning the limits of human adaptation. Forms of adaptation, both personal and organizational, developed to meet simpler

**** Emery and Trist, *op cit*.

types of environment no longer suffice to meet the new higher levels of complexity. The order of change represented is so great as to constitute a *transformation*.

Michel Chevalier* has drawn attention to the new type of diffuse social problems which arises under conditions of these complex turbulent environments. He refers to such problems as *meta-problems*. Not only have the problems themselves developed far wider ramifications through the increased connectedness in the causal texture of the environment but this quality of diffuse extension is also becoming more widely perceived. "Society has come more and more to perceive and articulate a new kind of problem. It is not only a matter of putting related problems together; new knowledge and expectations have caused a fusion, an interrelation of problems into a class of meta-problems. And society, once having perceived a meta-problem, begins also to perceive that courses of action to relieve it are inter-related. In fact, some comprehensive attack is now the only strategy acceptable to society." He refers to poverty, environmental pollution, and bi-lingualism and bi-culturalism as issues now widely recognized in Canadian society as being meta-problems. A rendition of this list for developing countries might read as follows: poverty, population, multi-lingualism and multi-culturalism. Others have analyzed a number of "systems" problems which are just beginning to attain meta-status in the United States. This exercise should be carried out for developing countries. It would bring out points of resemblance and difference both between them and more advanced countries and among themselves.

In complex turbulent environments, development administrators must recognize meta-problems and deal with them as such. This constitutes a *second transformation*. Unless this is realized by those responsible for formulating and executing policy, they will go on treating comprehensive meta-problems piecemeal as a series of discrete and isolable problems. They cannot in this way bring about the required collaborative "engagement" between political and interest group leaders, agency administrators and the numerous organizations and diffuse overlapping publics whose needs their policies are framed

to meet. The separateness of the programmes will perpetuate the myth of the independence of the client systems. Effective solutions to meta-problems depend on the collaboration of all concerned. Coercion cannot be effectively exercised: the higher level of complexity calls for a new mode of administrative regulation.

We may put it another way. With the single organization, however large, which usually has one general objective, together with a limited number of more specific objectives reconcilable through compromise, we have become reasonably expert. This is so whether these organizations be armies, industrial enterprises, churches, government agencies, or voluntary associations. But in handling organizational interdependences, where objectives are many, and priorities and conflicts less easily reconcilable we remain, by comparison, novices. It is these interdependences, however, and their relation to the unstructured publics which constitute the overall society, which create the meta-problem. We remain novices because we have been used (except in times of crisis such as depressions and wars) to a society in which, by and large, the ecological problems have taken care of themselves—as indeed they were expected to do in the ethos of pre-industrial and industrial societies alike. We need in all societies to develop a new institution-building capability in the area of organizational inter-dependences. This constitutes a *third transformation*.

With the increasing salience of complex turbulent environments auto-regulative processes, to use a term of Michel Crozier's,** are breaking down. We can no longer depend on them. In the opinion of Sir Geoffrey Vickers*** societies in all parts of the world are in danger of falling into "ecological traps".

Future Orientation and the Administrator's Active Role

It may be inferred from this turbulence that the maintenance of sufficient stability in the contextual environments has become a major requirement of administrators.

This has created what may be called the planners' dilemma: the greater the degree of change, the greater the need for planning,

* Michael Chevalier, *Stimulation of Needed Social Science Research for Canadian Water Resources Policy*, Privy Council Science Secretariat, Ottawa, 1967.

** Michel Crozier, *The Bureaucratic Phenomenon*, Tavistock Publications, London, 1964.

*** Sir Geoffrey Vickers, *Value Systems and Social Progress*, Tavistock Publications, London, 1968.

otherwise precedents of the past could guide the future; but the greater the degree of uncertainty, the greater the likelihood that plans right today will be wrong tomorrow.

Yet the only chance of maintaining a sufficient degree of stability in a complex turbulent environment lies in administrators taking the active rather than the passive role. With auto-regulative processes becoming less and less dependable, the passive role no longer constitutes an option.

This analysis shows why in relation to environmental change development planning and administration have become necessary in the contemporary world. It shows also that they may not be regarded as an already acquired capability but as an *unmastered art representing a new form of the political process* (in all nations whatever their stage of 'development').

Although the views of the future held by the administrator become critical, these should in the first place be based on an informed picture of the present. This entails preparing such forms of economic and social accounts as are feasible, with suitable "disaggregation". Sample survey data on attitudes, beliefs and customs should be added if possible, and systematic use of informants and panel discussions with opinion leaders in all sections of the society. This is the approach suggested in "The State of the Nation".*

The existence of strong pressures toward and uneven rates of change makes imperative the taking of regular readings on The State of the Nation. Unless this is done, the administrator is likely to make false assumptions about the real state of affairs in critical sub-systems of his society. "Just what is the status quo?" is a question that must be taken seriously. Such readings can serve three purposes:

(a) The preparation of short-run projections based on whatever forecasting techniques are feasible.

(b) The identification of high-risk areas, whether regions of the country, minority groups, processes of uncontrolled urbanization, externally vulnerable parts of the economy, special foci of conflict, etc.

(c) The separation of unchanging parts and aspects of the society from those

exhibiting certain degrees of change. These may be considerably different from what they are assumed to be, once the surface is penetrated.

A second and related aspect of future orientation concerns the early detection of emergent social processes and the assessment of their implications. Emery has made some cogent suggestions:

(a) "When the emerging system is relatively very weak, it will tend to manifest itself only in the parasitical effects it has on the energies of the host system—in *symptoms of debility*. These latter will find it increasingly difficult to mobilize energy (people) for their functions and there will be a slowing down of their responsiveness to new demands. The balance of forces may oscillate so that these symptoms occur in waves and make the functioning of the existing social systems less predictable.

(b) "When the emerging system is stronger but still not strong enough to displace the existing system we can expect to see *symptoms of intrusion*. What breaks through are social phenomena, like the swarming adolescents at Margate (and other coastal resorts of Britain) several years ago (or 'black power' and urban black riots in the United States), which are clearly not just errors in the functioning of the existing systems. At the same time, because of the relative weakness of the emerging social systems, they will usually only break through because of the existing systems. Their appearance will not obviously reveal the shape of the emerging system.

(c) "When the emerging system has grown to be roughly in balance with existing systems, there may be *mutual invasion* (as in the 'revolution' triggered by the student riots in France which challenged de Gaulle's regime).

"At this stage, it should be obvious that there is a newly emerging system but mutual retardation and the general ambivalence and lack of decisiveness may still lead the new system to be seen simply as a negation of the existing system. The methodological task is to identify, in the chaotic intermingling of the systems,

* Bertram Gross, *The State of the Nation*, Tavistock Publications, London 1966.

characteristics of the new system which are not simply an opposition to the old."*

A third aspect of future orientation concerns the modelling of "alternative futures" as a guide to decision-making. Only in very recent years has the concept of the future been replaced by that of alternative futures. If the change from singular to plural reflects the raised level of uncertainty it suggests also that the greater openness which the more rapid change rate occasions gives some scope for choice. The basic rationale of an activity such as development administration is to take the active role and to make the desirable futures more likely than the undesirable.

The replacement of the blueprint by the scenario as the guiding fiction of the planning process constitutes a new appreciation which has altered the "cognitive structure" of development administration. We have learnt following Gabor** that we must invent the future because we cannot predict it. The gain in this new approach lies in the separation of models whose properties can be known from realities whose properties can at best be only partially known and from eventuations whose probabilities are not calculable.

The construction of models of this type is a rigorous discipline. We have to make explicit the entire set of starting assumptions involved, including those concerning values. Simulation with the aid of the computer can bring to light many unintended effects. Recent suggestions concerning social observatories and urban laboratories may shortly allow large numbers of people to envisage more of the implications of alternative courses of action than they can at present. A new technology is coming into existence which will enable the political process to become both more informed and more participatory—if we so will. The development administrator should equip himself or some of his key subordinate units to use this technology.

II. Systems Aspects of Welfare and Development

In this section we shall remove the concepts of welfare and development from their everyday connotations and attempt to estab-

lish their basic characteristics as general properties of open systems. This will entail (a) distinguishing the system states to which each refers; (b) considering additional factors which must be taken into account in relation to social as compared with biological systems; (c) similarly with reference to larger rather than smaller social units; (d) explicating the relations of the two concepts to each other under different sets of conditions; (e) this last with special reference to the implications of system complexity when associated with rapid and uneven change.

In the relations of the system (whether organism or organisation) to its environment welfare and development are complementary states which are positive for the adaptive process. They have thresholds (standards) which must be determined empirically. The attainability of states above the threshold raises a further set of questions, which need not detain us here, except to note that in the case of man the limits remain unknown. Below the threshold welfare and development turn into their opposites—states which are negative for adaptation and survival

a. *Welfare* or *well-being*, to continue to function well, refers to states of a system under conditions which maintain the steady state. Its opposite, *ill-fare* or *ill-being*, to be dysfunctional, refers to states of a system under conditions which do not permit the steady state to be maintained. This set of terms therefore is concerned with the 'statics' of adaptation—with stability (not to be confused with stagnation which is a state of ill-fare) and with the regulation and maintenance of stability.

b. *Development*, or *progression*, to continue to advance, refers to processes by which a system reaches higher order steady states of a more adaptive nature. Its opposite, *deterioration*, or *retrogression*, refers to processes by which the system returns to states of a lower order (stable or unstable) which are maladaptive. This set of terms, therefore is concerned with the 'dynamics' of adaptation—with positive change leading to the establishment of widened and preferred orders (not to be confused with negative change which leads to disorder or to greater constraint). Development involves discovery and innovation. It is concerned with the regulation of growth.

* Emery, F. E., "The Next Thirty Years: Concepts, Methods and Anticipations", *Human Relations*, 20, 3. 1967.

** D. Gabor, *Inventing the Future*, Alfred A. Knopf, New York, 1964.

Both biological and social systems contribute since man belongs to both. Without assuming that the isomorphism of system properties is complete between biological and social systems or between social units of dif-

ferent social magnitudes, we may nevertheless essay a first list of properties basic to states of human welfare and development and their opposites.

Bio-social and Socio-cultural System States

Welfare (Well-being)	Ill-fare (Ill-being)	Development (Progression)	Deterioration (Retrogression)
Intactness	Impairment	Maturation	Arrest
Robustness	Vulnerability	Learning	Retardation
Self-regulation	Breakdown	Extended adaptability	Restricted adaptability
Integration	Dissociation	Cultural accumulation	Stagnation
Independence	Dependence	Product accumulation	Waste
Interdependence	Isolation	Environmental expansion	Contraction
Coordination	Scatter	Innovation	Obsolence
Cooperation	Conflict		

As we pass from bio-social to socio-cultural systems, in relation to welfare we may transpose the concept of the intact functioning organism (organization) as constituting the necessary conditions, but add that of a higher order of intra-population interdependencies as constituting the sufficient conditions for maintaining the steady state. In relation to development we may transfer the concepts of maturation and learning but add those of actively transforming the environment (through technological change) and the cumulating information (through cultural transmission). These points are of course related to the fact that the socio-cultural systems which the bio-social human individual forms with other such individuals have an altogether higher order of openness from those formed by other species. The thresholds (standards) themselves change, as the norms which determine expectations change with society.

In relation to socio-cultural systems, welfare and development share a *common set of dimension*. These represent *categories of value* such as those proposed many years ago by Spranger:

- a. economic
- b. social
- c. political
- d. scientific
- e. aesthetic
- f. religious.

States of welfare/ill-fare and of development/retrogression exist in some such multi-dimensional set as universal attributes, however much emphasis may vary between societies and among individuals and groups within a society. Certain thresholds of provision tend to become established through the operation of social norms as rights; certain thresholds of performance as duties. In the "progression" from pre-industrial, through industrial, towards post-industrial societies, each of these dimensions has tended to establish itself as a domain within which welfare and development rights may be asserted and duties expected. Moreover, the thresholds have tended to be set at higher levels.

Welfare and development share in common referents at all orders of social magnitude:

- a. the individual.
- b. the family and various forms of kind-ship system.
- c. formal and informal organizations.
- d. communities, i.e. ecological systems: local, regional, national.
- e. transnational entities—even the world as an emerging interdependent system.

States of welfare/ill-fare and of development/retrogression exist in social units at all system levels as well as in all socio-cultural dimensions. The levels are qualitatively as well as quantitatively different as regards the types of relationship they involve. Their wel-

fare and development requirements pose problems which are correspondingly different, and which may be in conflict. Nevertheless, they are inter-dependent, the degree varying with the complexity of the environment. If in pre-industrial societies the *kinship system* tends to be the most salient component of the social structure, in industrial societies it is *formal organizations*; while in post-industrialism it would appear that *ecological systems* are likely to take this role.

The relations of welfare and development take three principal forms: when development is a function of welfare; when welfare is a function of development; when welfare and development are inter-dependent functions. The form of these relations is determined by the types of environment with which a society, or a relatively autonomous part of it, are directly correlated.

(a) *Development as a function of welfare.* This state expresses the relation which obtains under conditions of the more placid environments where the maintenance of stability is the principal requirement for adaptation. This state is typified by pre-industrial societies, particularly in their earlier and simpler forms:

(i) Welfare is maintained by auto-regulative processes operating through the kinship system, which plays the role of a "leading", or pivotal, part.

(ii) Development measures are required to maintain established states of welfare when auto-regulative mechanisms can no longer cope in face of internal and external threats. Development processes under these conditions are not auto-regulative but involve taking the active role. Modes of intervention in these societies, however, are characterized by the use of coercive methods, illustrated in the rise of autocratic regimes and regular armies.

(b) *Welfare as a function of development.* This state expresses the relation which obtains as the environment becomes more dynamic, when internally generated growth (resulting from technological change) is now the principal requirement for adaptation. This state is typified by industrial societies.

(i) Development is maintained by auto-regulative processes operating through the market system, where enterprises now play the role of the leading part.

(ii) The welfare of increasingly numerous classes of people and segments of the society, however, is no longer auto-regulative. The maintenance of their welfare requires the taking of an active role. Modes of intervention in industrial societies cannot remain solely coercive if disturbances of a revolutionary type are to be offset. Legislative reform based on "democracy by consent" makes its appearance.*

(c) *Welfare and development as inter-dependent functions.* This state expresses the relation which obtains as Type 4 conditions become salient in the transition to the post-industrial society. Adaptation now depends on the ecological regulation of the interdependencies in all their dimensions of the innumerable sub-systems which characterize large societies undergoing rapid but uneven change.

(i) The welfare of sub-systems now inherently involves their development; otherwise the accelerating change-rate soon renders them obsolescent—when they fall into states of ill-fare.

(ii) Sub-system interdependence also increases so that states of ill-fare in a relatively few sub-systems (especially if their position is crucial) can produce widespread dysfunction in larger systems. The development of particular sub-systems is dependent on the welfare of other sub-systems to a greater extent than when the degree of inter-dependence is less.

(iii) Unevenness in a change-rate widens the range of outcomes, so that social segmentation increases. The number of groups perceiving themselves, or being perceived, in sub-threshold states becomes greater as the expectations which set the thresholds rise and as the sense of "relative deprivation" grows.

(iv) The effects of these contradictory trends are magnified by an increase in the number, diversity and size of sub-systems, which raises the overall level of complexity.

(v) This, in turn, raises the level of uncertainty. It now becomes less possible for a given sub-system to remain directly correlated with a relatively closed set. Each member of the immediate set to which a sub-system belongs

* H. Clegg, *Industrial Democracy*, Oxford: Blackwell, 1960.

tends to be linked with a growing and changing number of other sets, which cannot be completely identified. These sets tend, moreover, to be related to each other in different ways, and often belong to different "universes". It therefore becomes harder to predict if, or for how long, a particular sub-system will continue to develop, or remain in a state of welfare.

The meta-problems created in this situation the limit within which auto-regulative processes can adaptively operate with respect to either welfare or development, so that an active role becomes generally required.

As this need to take the active role becomes more general it changes the quality of the society. Hence the need to distinguish post-industrialism from industrialism. Hence also the relevance of Lawrence Frank's contention that a new political theory is required.*

With the passive role no longer constituting an option, the central issue becomes the character of the active role. There are two main and opposite directions in which this role can develop. One, modelled on the principles of the physical sciences, would lead towards a more engineered society. The other, modelled on the principles of the sciences of life, would lead towards a more organic society. It has become possible to state the choice between these two models in system theory terms, as Dr. Emery has attempted in his 1967 paper quoted in section III of this supplement.

Our analysis may now be extended as follows: that at the higher level of complexity which characterizes the transition to post-industrialism a higher quality is required in *all* primary social units. By primary social units is meant the set of concrete social resources which exist in the life-space of the individual, i.e. the people and institutions with which he directly interacts and to which he contributes his own resources; his family, his work-place, the school his children attend, the particular community in which he resides, the services and amenities actually available to him: in sum, all those entities which compose his *primary social world*. The quality of these resources, in his case, determines for the individual his "quality of life", on which his welfare and development

alike depend. The objective of taking the active role is to bring into being ecological systems able to maintain primary social worlds of high quality throughout a society. How to do this has now become the overriding question as we move towards post-industrialism.

III. An Active Role for the Social Sciences and Choosing a Design Principle in Relation to Values

"It should be clear by now that, with planning, the social sciences can play an active role in the next decades, not simply a passive one—they can seek to modify directly their social environment in order to help men better to pursue the ends they desire and not be left to adapt passively to whatever blindly emerges. Insofar as the social sciences are concerned simply to adapt to the next thirty years, then planning for the future would be based on extra polations of the sort that 'by the 1990's x proportion of the population of size X will be in schools; given the past rate of increase in educational psychologists per ten thousand students, we must plan for a supply of ...' This sort of approach would leave unconsidered whether it might not, for instance, be better to develop a theory of pedagogy or a re-organization of industrial culture that would radically change the multiple effects of the educational psychologist or the pre-eminence of schools as places of learning. Paradoxically, the problem of making predictions would be easier if the social sciences stuck to a passive role. By actively seeking to enhance man's ability to control himself and his institutions, the social sciences are more likely to contribute to genuine unpredictable novelty. Men would have greater control, but the manner in which they would exercise it would be less obvious than if they continued as at present.

"The distinction we have been trying to make has been rigorously made by Sommerhoff in terms of 'adaptation' and 'directive correlation'.* Adaptation refers to the responses available for dealing with emergent environmental circumstances. The concept of directive correlation encompasses adaptation in that it allows for that system of causal relations in which the environment is actively influenced to determine the kinds of responses that will subsequently be adaptive.

"Passive adaptation is restricted to initial conditions of an environmental nature, i.e., it

* Lawrence K. Frank, "The Need for a New Political Theory," *Daedalus*, 96, 3, 1967.

represents a stimulus-response relation. This, we hasten to add, is not a simple cause-effect relation. As Angyal* phrases it, '... the stimulus prompts the response. The response is mainly determined by the intrinsic tendencies of the organism ... (it) is essentially an autonomous function' (p. 36). The stimulus for its part is, with respect to the organism, embedded in and predictive of heteronomous processes. An object or event in the environment has stimulus qualities only insofar as it is part of such a coupling of separate systems. This, however, represents only one form of directive correlation. The other is the form of coupling that occurs, for instance, when a man lights a fire. In this case, his wit and action sets off an environmental process that enables him by appropriate responses to pursue goals of warmth, cooking, of visual contact, of security, of distillation, etc. Making fires is not only an adaptive response to the sun going down but can be a starting condition (a cœnetic variable, from the Greek *cœnos*—beginning) for a range of other purposive activities.

"To be applied to the next thirty years of the social sciences, this simple model of directive correlation would have to be elaborated because (a) the key environmental processes are people who are capable of directive correlating their activities with the social sciences, (b) in any real situation the social sciences will be involved in more than one other process, and (c) the time scale involves a hierarchy of directive correlations within which the goals of the earlier ones are the starting conditions of the following.

"However, the active role of the social sciences in the coming decades is not reconcilable with the social sciences seeking to determine the future of man. Unlike the other sciences, the social sciences cannot be indifferent to their subject matter. They cannot, in fact, expect to survive, let alone grow, unless they pursue goals that are shared by their chosen objects of study. No matter how cunning or devious the social scientist became, it is almost certain that his subject matter would eventually outmanoeuvre him, as no physical particle could.

"The survival and growth of social science presupposes a role in which it enhances the range and degree of directive correlations

that men can form between themselves and their environment. Specifically, this might mean increasing the range and efficiency of the responses they are able to make or extending men's awareness of the goals they might successfully pursue. In each of these ways the social sciences can contribute to men's ability to choose and to make the next thirty years.

"This contribution is only meaningful if, in fact, men have some ability and some desire to shape the future. We assume this to be the case, allowing only that (a) men can only proceed from the objective conditions of the present, (b) they tend to pursue only those goals that seem to be achievable, (and hence may often be blind to possibilities that have newly emerged), and (c) the means they choose may frequently have unanticipated consequences for other goals.

"The choice is really between whether a population seeks to enhance its chances of survival by strengthening and elaborating special social mechanisms of control or by increasing the adaptiveness of its individual members; the latter is a feasible strategy in a turbulent environment and one to which western societies seem culturally biased.

"We have stated that choice is unavoidable. What makes it unavoidable is what we might clumsily call a design principle. In designing an adaptive self-regulating system, one has to have built in redundancy or else settle for a system with a fixed repertoire of responses that are adaptive only to a finite, strictly identified set of environmental conditions. This is an important property of any system, as an arithmetical increase in redundancy tends to produce a log-increase in reliability. The redundancy may be achieved by having redundant parts but then there must be a special control mechanism (specialized parts) that determine which parts are active or redundant for any particular adaptive response. If the control is to be reliable it must also have redundant parts and the question of a further control emerges. In this type of system, reliability is bought at the cost of providing or maintaining the redundant parts, hence the tendency is toward continual reduction of the functions and hence cost of the individual part. The social system of an ant colony relies more upon this principle than does a human system, and a computer more than does an ant colony. The alternative principle is to increase the redundancy of functions of the

* Andras Angyal, *Foundations for a Science of Personality*, Harvard University Press, Cambridge, 1958.

individual parts. This does not entail a pressure toward higher and higher orders of special control mechanisms, but it does entail effective mechanisms within the part for setting and resetting its functions—for human beings, shared values are the most significant of these self-regulating devices. Installing these values of course increases the cost of the parts. The human body is the classic example of this type of system although it is becoming more certain that the brain operates by means of overlapping assemblies based on similar sharing of parts.

"Whatever wisdom one attributes to biological evolution, the fact is that in the design of social organization, we have a genuine choice between these design principles. When the cost of the parts is low (in our context, the cost of individual life), the principle of redundant parts is attractive. The modern Western societies are currently raising their notion of the value of individual life, but a chance in reproductive rates and investment rates could reverse this. There is, however, a more general principle that favours the western ideal. The total error in a system can be represented as equal to the square root of the sum of the squares of all the component errors. It follows that a reduction in the error of *all* the components produces a greater increase in reliability than does an equal amount of reduction that is confined to some of them (e.g. to the special control parts). We are certainly not suggesting that this principle has been or is even now a conscious part of western ideologies. Some sense of it does, however, seem to have reinforced our prejudice toward democratic forms of organization."

Restricted until publication in "Main Trends of Research in the Science of Man", Unesco, Paris, 1969.

IV. The Search for a Policy for the Social Sciences

The Need for Planning

The right of the social, along with the biological and physical, sciences to a place among 'the sciences' is no longer disputed. Neither is their utility. These are no longer real questions. The real question is: that the demand for the development and utilization of the social sciences is rising at so rapid a rate that there is doubt whether it can be effectively met. Given the present state of some of the disciplines, present patterns of

organization and training, and present levels of financial support and manpower resources, the chances of effectively meeting it are non-existent—unless efforts are made to introduce planned change on a substantial scale.

Concern over this has led to a search in a growing number of countries for a policy for the social sciences. In several Western European countries bodies at the national level have come into existence concerned in one way or another with co-ordination and planning. In other countries, including the United States, surveys of the situation are under way to appraise national social science capability. In Eastern Europe policy-planning bodies which include the social along with the other sciences have been in existence for some time. Not until recently, however, have they been faced with the prospect of allocating resources on a substantial scale.

In the advanced countries the search for a policy for the social sciences is becoming intensified, since the resources they consume are now large enough to become publicly visible—however small they may be in comparison with those allocated in the natural sciences, or however short they may fall with respect to need. Moreover, expenditure on the social sciences is rising faster in some countries than expenditure on all other sciences combined. Social science expenditure has, however, started from an incomparably smaller base.

In addition, governments, directly or indirectly, supply the bulk of the funds. The social sciences have become politically accountable. In the United States social science has become 'big science'. Tactical deployment of resources on such a scale by uncoordinated means shows diminishing returns. For the sake alike of their development as sciences and the realization of their value as resources strategic planning of social science activities has become necessary. The difficulties and dangers of attempting this without doing more harm than good are immense. Very little experience is yet available; and any planning process is liable to serious error. The number of alternatives is considerable. It will take some time to discover which are to be preferred in different societies.

Some Dangers of Planning

Multiple sources of funds and multiple centres of decision-making should be retained, however 'co-ordinated'. Otherwise, there

would be cause for serious alarm. Toleration of different viewpoints is a 'must' for the development of the social sciences. So many questions of theory and method remain unsettled that openness of mind is an overriding requirement. The fashioning of effective policies depends on an open dialogue, continuously maintained, between social scientists in all disciplines and all types of social science organization and policy-makers both inside and outside government in all major domains of social action. A cluster of inter-related and inter-acting bodies with complementary roles, rather than one organ, seems to be what is emerging in countries attempting science planning in any field.*

There is danger that too great a proportion of available resources will be invested in projects limited to present concerns (both theoretical and practical) rather than be anticipative of future needs. If the social sciences are to take an active role in permitting better choices to be made among alternative futures, how to discern future needs becomes a central issue. Though this is beginning to receive attention, a number of difficult conceptual and methodological problems will require solution before much progress can be made.**

Institution Building

The three output mixes which have been distinguished merit study by policy/planning bodies for the purpose of building the most adaptive types of social science institution:

(a) the *research/application* mix in which research—usually but not necessarily of an inter-disciplinary kind—on generic field-determined problems is undertaken with students taking junior roles in on-going programmes involving clientele systems;

(b) the *research/teaching* mix in which basic research—usually but not necessarily within one discipline—can proceed in areas not involving engagement with clientele systems and where students can make original contributions at an earlier stage;

(c) the *research/service mix*, where the focus is on more concrete problems but where there is scope for students to gain experience as 'internes'.

Basic university departments are appropriately centred on (b) with some (a) and a little (c); professional schools on (c) with some (a) and a little (b); special institutes (whether within or outside universities) on (a) with some (b) and a little (c). All three patterns are necessary; but unless their objectives are kept distinct, dysfunctional interference occurs, and findings, students and clients all suffer. A good deal of such interference goes on at the present time. One objective of social science policy would be to develop a balanced system of complementary institutions which would remove this.

Decision-making structures are likely to be, and should be, different for the research/application, the research/teaching and the research/service mixes. In the research/application mix the most effective choices are likely to be the outcome of complex 'appreciations' which grow up between groups of social scientists, client organizations and representatives of broader sections of the society. Such processes could lead to the establishment of a number of applied research councils (titles will vary) concerned with developing strategic relations between the social sciences and major sections of a society. The research/teaching mix would be handled by bodies responsible for continuously reviewing the most promising avenues of fundamental research. Paradoxically, unfashionable innovations may be most effectively nurtured by user-interests concerned with the research/service mix. Some of the most promising new ideas arise in this area. They do not consume much in the way of special resources in their early stages and may go on quietly as an adjunct of service until enough headway has been made for support to be sought in terms of one of the other two mixes. This is the common way in clinical research.

Developments have been held back by the confusion which has persisted concerning the relations of pure and applied research. These are different in the social and the natural sciences. In the latter the required data can be abstracted from their natural settings to a far greater extent than in the social sciences. Moreover, their 'permission' does not have to be asked before they can be used. Except in

* For the idea of a cluster of organizations rather than a single organization being involved in planning processes even when these are highly centralized, vide Bertram G. Gross, ed. (142) 1967, *Action Under Planning*, and *The State of the Nation*, 1966, by the same author, (141)

** Cf. F. E. Emery, 1967, *The Next Thirty Years: Concepts, Methods and Anticipations*. (140)

special areas the social scientist must gain access to his material in its natural setting in ways which are acceptable to those concerned. This means that engagement in problem-oriented research represents a major strategy for advancing the knowledge base in the social sciences.

The effective development of the social sciences towards the needs of the future requires the establishment of genuinely programmatic research sustained over long time periods on carefully selected themes by institutes with the stability, scale and 'requisite variety' of resources to enable them to commit their members to such objectives. For reasons alike of the state of the social sciences and the needs of societies a good proportion of these programmes should be in areas of generic field-determined problem-oriented research. At present there is too great a dispersion of research effort in small and unstable organizations. This has caused a random accumulation of projects rather than an evolving cumulation of findings. Amongst other reasons this has been caused by the persistence of a tradition of academic individualism among research workers. Echoing this grant-giving bodies have tended to prefer the apparently reduced risk of backing a large number of small projects to the apparently increased risk of giving support to a limited number of large but strategically selected programmes. A main task of social science policy would be to put this situation right and to create the 'enabling conditions' for strategic programmes to be undertaken.

Problems of Manpower

Overall arrangements in a country's total 'social science system' require to be planned so that maximum free movement of scientific personnel becomes possible between organizations centred on any of the three mixes. Scientific personnel should also be able to circulate freely between organizations which primarily form part of the academic world and user-organizations which employ social scientists but belong primarily to the operational world. Otherwise, the requisite variety of career paths will not be available to permit a body of social scientists to come into existence large enough or flexible enough to meet the rising demand. There will be a dysfunctional separation between teaching and research; and a similar dysfunctional separation between the types of research going on outside and inside universities. There will also be a severe splitting between the aca-

demic world and the user-organizations which contain the clientele systems critical for the development of the knowledge base. Adverse effects of these kinds exist in most countries at the present time, quite often to a serious degree.

A shortage in social science manpower must be anticipated, both with respect to quantity and quality. Universities should be encouraged to expand their teaching facilities in the social sciences and governments and other sponsors to provide the funds. The best results may be expected from the establishment of comprehensive schools of social science, including the full range of the basic disciplines, at both undergraduate and graduate level. Multi-professor, as opposed to single professor, departments are to be preferred. A central objective would be to establish a minimum number of centres of excellence which could attain 'critical mass'. The highest priority in many countries would be to introduce accelerated forms of graduate training.

Professional as distinct from basic education requires parallel acceleration. Only through the extension and enlargement of the social professions will the social sciences be effectively applied in user-organizations. These professions are of two kinds: those directly deriving from the social sciences, such as administration and education; those depending on a substantial ingredient of the social sciences, such as engineering, medicine, law, architecture, urban and other forms of planning. Many of the key decisions concerning the future will be made by members of these professions. It is essential that social science understanding be built into their education.

Small Countries

The smaller the country the more severe become the problems of scientific choice. It is not practicable in small countries for social research to develop in more than a limited number of directions. Countries with less than 5 million inhabitants represent the extreme case; but any country with less than 20 million inhabitants faces serious dilemmas. Even considerably larger countries cannot 'do everything'. These dilemmas persist even when the country concerned is among the more advanced. If more complex and sophisticated resources are now available the problem still remains of using them to achieve

'critical mass' in more than a limited number of areas.

One direction of solution would be to establish regional linkage between a group of countries with close affinities in culture, language and geographical setting. The number of centres of excellence available to the region as a whole could then be maximized. Given their traditions, small countries often display a 'distinctive competence' in particular research areas. These are the foundations on which to build 'comparative advantage'. Small countries may offer the best environmental opportunities for the pursuit of certain classes of problem. With respect to these they may become world centres.

Small countries may offer greater leeway for innovation once the break with academic traditionalism has been made. The enormous professional machines characteristic of large countries may hamper innovation. It is noteworthy that a country such as Norway has become conspicuous in peace research, cross-cultural studies in political science and action research in industrial democracy. The ecology of such developments merits study. What socio-environmental conditions produce the greatest amount of social science originality per capita?

Developing Countries

In the decades immediately ahead the social, rather than the natural sciences are to

be envisaged as playing 'the leading part' in increasing the overall scientific capability of the developing countries. Progress in the physical and biological sciences can for the time being be left to the more advanced countries. Resulting technological benefits can to a great extent be 'bought in'. What developing countries must achieve for themselves is a fundamental understanding of all aspects of the 'development' process. For this the social sciences represent the critical resource. Moreover, professional personnel must be trained in sufficient numbers to implement what is learnt in change programmes which are self-determined. On this background greater natural science capability can be more effectively utilized.

The role of the more advanced countries is to assist in building up the required social science and plan-implementation capability of the developing countries. At the present time, too many of the most promising social scientists and professionals from these countries stay too long in the universities of the more advanced countries. Quite a number remain permanently. Too much of the social research being done in the developing countries is being carried out by research workers from the developed countries. This trend needs to be reserved through international cooperation.

APPENDIX "40"

CANADIAN TRENDS IN BEHAVIORAL
RESEARCH
A BRIEF REVIEW AND ASSESSMENT*
THOMAS PHILBROOK**

A background paper
prepared for the Round Table
on the Social Aspects of Science Policy,
under the auspices of
the University of Toronto
Harry M. Cassidy Memorial Research Fund,
27-29 March 1969, Toronto, Canada

The startling fact of social and behavioral research in Canada is its tremendous growth in the last decade. This growth is revealed in the sheer increase in the number of social and behavioral scientists in Canada, the amount of money being directed to this kind of research, the mushrooming of research institutes and the breadth of research interests and concerns now being routinely pursued. The first part of this paper is devoted to a brief description of some major features of this growth. The second part is an assessment of these growth trends, with special emphasis on the relationship between social and behavioral research, on the one hand and social policy at the governmental level on the other.

Underlying this review and assessment are two themes. First, that there is a consuming interest evident in the phenomena of change in all its forms. Second, that one of the dominant problems facing behavioral research in Canada lies in developing organizational forms which provide a climate congenial to its conduct and financing.

The Canadian Scene

Since a large proportion of the behavioral and social science research community is located in the universities, its growth closely

parallels the considerable expansion of university programs in recent years. There now is in the universities a substantial pool of behavioral scientists actively pursuing research interests, individually and in teams. Such a pool was simply not present ten years ago.

Another outcome of university growth has been the establishment of a full range of behavioral science departments on almost every campus across Canada. From the research standpoint, this development has meant that it is possible to find academicians interested in various sub-disciplines and skilled in specialized study areas. One finds now, for example, experienced family sociologists, demographers, econometricians and so on. Nonetheless, Canadian universities still have a long way to go before they acquire the range of specialized talents to meet the present research demands. Right now, most university departments are still trying to fill out the basic staff complement necessary to undergraduate and graduate courses in these fields. They have not really begun to staff for specialized research needs—and perhaps never should.

The growth in the number and type of behavioral science departments with concomitant increase in enrollment is providing a fairly large supply of young people capable of filling positions of research associates and assistants. For the most part, these people are trained to the B.A. or M. A. level; the output of Canadian Ph. D's in the behavioral sciences is still relatively small. In fact it does not

* This is a preliminary draft which does not contain the documentation and references to research studies that form the basis of this assessment. The final version will, of course, be fully documented.

** Chief, Social Development, Rural Development Branch, Department of Forestry and Rural Development, Government of Canada.

even meet purely academic demands let alone research and policy requirements.

Finally on the university scene, the course selections and departmental orientations are becoming more slanted toward training in research. Methodology and statistics courses, basic to the development of research skills, are becoming common. Similarly, most students can now obtain some research experience, either within their university or in government, before entering graduate school. A frequently pertinent question is the degree to which these courses carry specific Canadian content and reference. I think we may expect that as behavioral research steps up in Canada it will become increasingly possible to offer more courses with high Canadian content.

The shortage of manpower for behavioral science research is also characteristic of other scenes. In government, tight budgets, spending constraints and staff freezes have worked at present to slacken the demand for researchers. Yet even with these constraints, research or research/programming positions requiring behavioral science qualifications are still difficult to fill. In the private sector, where search in the behavioral sciences is playing a role of increasing importance in the management of large corporations, a similar pattern prevails.

Immediate supply and demand problems aside, growth also typifies the trends in behavioral science research outside the university. Economists were the first of the social scientists to be brought into federal government. Their entry began back in the thirties and mushroomed in the late fifties and early sixties. All economists in the federal government, of course, do not engage in research; yet a substantial proportion of them do and probably most have had experience in research. The economist, incidentally, can be found in almost every department and research establishment of the federal government.

Although few in number sociologists are becoming quite popular in Ottawa. Other behavioral scientists are also becoming common on the federal scene and the traditional disciplines are to be found scattered throughout all departments. These range from planners and political scientists to researchers in education and social work. The newer fields that have a high social science emphasis such as systems analysis, operational research and communications are also increasingly represented and demanded.

In all, these behavioral scientists have a considerable role in shaping research trends in these disciplines. Although their main input is not so much in research *per se*, the impact on research done by private consultants and university researchers is great. Not only do they initiate studies and influence departmental, and in some instances overall government, research policy, but they also play a role in allocating research funds and in applying research results to policies and programs.

While the federal government may be the single largest employer of behavioral scientists in Canada, they are also well represented in the provincial governments and in the large urban municipal governments. Like their federal counterparts, these behavioral scientists as officials do not influence research by doing but chiefly by buying and using. Chief among the sellers of applied research are the private consulting firms.

The model most of these firms strive to follow is one that is generally present in the United States and other western countries. Typically, the firm will seek to build a multidisciplinary staff composed of specialists from the traditional and the new systems-oriented fields of behavioral science. Some attempt is usually made to link these professional behavioral researchers to specialists in physical resource fields and engineering. The work is organized on project lines and emphasizes a team approach. The firm will endeavor to draw its business from both the public and private spheres. It will also try to do some specialized research and advanced development work, funded internally from profits set aside for this purpose. There naturally are variations from this model, but regardless of the variations it is actively followed.

There are two other important institutions in addition to private industry, consulting firms, government establishments and universities, through which behavioral research is conducted. There are the nongovernmental organizations such as the Canadian Welfare Council, the National Planning Association, trade associations, Canadian Association for Adult Education and so on; and there are the newly emerging behavioral research institutes. The voluntary organizations engage in behavioral research on an in-house, grant or contract basis. The research almost always has a direct relation to the association's special interest although some are going further afield by taking an interest in research as an

organizational function in its own right. At any rate, the promotion and conduct of behavioral research has become fashionable for these associations, its pursuit is constrained chiefly by limited funds.

Behavioral sciences research institutes are appearing on university campuses everywhere in Canada. The research focus of these institutes ranges from psychology (McGill) and survey research (York) to anthropology and Atlantic area studies (Memorial). Some have produced a number of studies and monographs; they all seek to merge some aspects of the consulting firm model with the traditional academic structure. In spite of the rapid increase and serious intentions of these institutes most have limited funds and no endowments and frequently exist more on paper than in fact.

In the previous section, I have stressed factors that revealed the growth of behavioral research. Growth of course is relative. Looking at the same scene, the Economic Council of Canada, in its *Fifth Annual Review* found it necessary to conclude that the social sciences "... remain relatively underdeveloped in Canada" (p.53). It sees them as underdeveloped chiefly in relation to the amount of financial support given and in relation to the social problems confronting us. There are no doubt few in the behavioral science community who would disagree with this. However, the significance of this statement lies not in what it says about the behavioral sciences but in the public recognition by a senior government agency of the importance of these sciences in the social life of Canada. In short, it legitimizes them.

Central to the social aspect of science policy is the shape and direction of behavioral research. There are two major questions that must be addressed when the shaping process of research—in a broad view and as a social activity important to the nation—is examined. First, what are the factors that have shaped research activities in the past? Second, what are the factors that ought to shape the direction of research in the future? These are two questions that link the assessment of trends in research to the making of science policy and ultimately to the use of research and amount of support.

By way of transition two points need emphasis. First, as noted in the beginning of this paper, one basic problem in the conduct of behavioral research is its institutionaliza-

tion, particularly in the university setting. By and large we try to fit research institutes, or more generally the organization for the conduct of research, into the traditional university structure. This creates a serious problem because increasingly the interdisciplinary and team-work model is the accepted model for research. The point is that neither the university structure nor the method of financial support are designed to accommodate this model. At this point in time, I would suggest that the research organization tail ought to wag the university and funding dog. (The phraseology is not meant in an uncomplimentary way.)

Second, behavioral scientists and the buyers and users of the research are becoming increasingly concerned with its social purpose and action. This is revealed in the selection of research topics, e.g. problems of economic development, mobility, teaching the disadvantaged, developmental administration and so on. These topics have, of course, theoretical and basic relevance to a discipline, but increasingly they are being slanted towards matters of social-economic policy and change. This slanting is not being done solely by the users of research but also by researchers in the proposals they submit and the interests they express. Similarly, there are a substantial number of behavioral scientists becoming involved in action projects at the local level; regional development planning and organizational change. Their motivations and specific interests vary greatly. Nevertheless, these interests do reveal a movement away from the older view of research for research's sake.

The trend towards behavioral research institutes and social action interests of researchers is contributing greatly to the formulation and implementation of social policy, especially that dealing with change. The nature of this contribution is best shown in the linkage between the conceptualization of policy and research. There is, however, seldom a direct link. Research generally enters in the middle of the policy formulation process one that might transpire over a five to ten or more year period. In sum, new policy pronouncements influence trends in selection research topics; the resulting research has an impact on the further shaping of policy and in turn on the specification of what research ought to be done.

Social Development and Research Trends

The emerging concept of social development nicely illustrates this policy process and the ways in which it shapes research trends. Recent years have seen an increasing application of the term social development to government legislation, policies, programs and, indeed, tax measures. While widely used, the term lacks clear and specific meaning. Its use still depends largely on the semantic goodwill holding between users. Nonetheless, a measure of agreement about the meaning of social development has emerged. Underlying this agreement is an exchange between policy and program definition on the one hand, and empirical research in the social and behavioral science on the other. This exchange is financial, administrative and substantive.

First, social development has been generally recognized as a special form of social change characterized by planned intervention, normally by a public or governmental agency, into the lives of individuals and regions. The purposes of these interventions are usually to secure improved modes of living for individuals or groups within specified communities or regions. What the nature of these improvements is, is a contentious issue but one which a range of economic and social studies are helping to clarify.

Second, these improvements are inevitably stated in broadly economic terms. Hence, we have training programs designed to increase earnings and employability, or industrial incentives to improve local economics. In some cases, the means are indirect, when for example the focus of action is in bettering publicly provided amenities and services, e.g. health, education, and employment services. Generally speaking, the social side of program objectives of this kind are seen as the program benefits to individuals while the economic benefits are those accruing to the society or economy at large. However, the calculation of benefits to individuals seldom achieves quantifiable precision and is always fraught with contentious value and methodological assumptions about what these benefits are and just what is to be measured. This stands in contrast to the seemingly concrete character of economic benefits.

There has been a substantial amount of research into the means and program elements within this second area of agreement. Studies, based mainly on data from the Dominion Bureau of Statistics and National

Revenue, have been done on patterns and distribution income. Similarly, research on the effects of training on wages is being done along with numerous on the delivery, administration and integration of a broad range of social services.

Finally, there is a large body of work being carried on in both public and private sectors, on costs and benefits of programs and further refinements in the methods of calculating them.

A third element found in social development programs is a focus on low income segments of the population. Not only does this focus coincide neatly with the increasing of income and employment as legitimate objectives of public programs but it tactitly upstages a whole range of social concerns from the problems of discrimination and cultural differences to those of administration of justice, welfare and social services generally. Perhaps more fundamental from the perspective of value assumptions underlying programs, the income and employment objectives create an illusion of homogeneity within the low income strata a one dimensional social class system in which an individual's life chances are largely, if not fundamentally, determined by his income and employment positions.

Probably one of the most thoroughly researched and validated propositions in the social sciences is that which conceives the class structure as multi-dimensional. Certainly one of the major dimensions of a class structure is wealth which in modern societies is largely determined by an individual's occupation. But other dimensions, such as power, prestige, culture and community of origin play an equally significant role. Moreover, the class position of an individual or strata within society is determined not so much by a single dimension but by the combination of dimensions and inter-relationship between them. In short, to approach social development or the problems of poverty from a perspective based solely, or even chiefly, on income and employment, tremendously over simplifies the analysis of these problems and the credibility of proposed solutions or programs.

These three points of general agreement equate social development thought, policy and programs with anti-poverty measures. Through this equation, generally accepted efforts to improve personal income, productivity and employment at the lower end of

these scales can be conveniently linked to more contentious issues of social reform and inequalities. Such a linkage has the advantage of presuming an economic payoff to social change and social expenditures which are, in turn, justified on moral or general social welfare grounds. Yet it is hardly reasonable, conceptually or factually, to expect sensible or workable programs to be created from an idea of social development which restricts itself solely to the consideration of the lower income strata of a population. Programs are, of course, put into operation but because of the poverty of the initiating ideas they suffer from operational incompleteness that almost invariably necessitates expedient repair.

It would seem evident that social development is a far broader concept than the linkage to anti-poverty measures would allow. The concept of it as a special form of social change gives a more realistic scope. When social change is seen as generally pervasive in modern societies and occurring at an accelerating pace then the full breadth of social development begins to emerge. It means that the objectives of social development exert a significant influence on the direction and course of social change in society. It means that social development policies and programs are not relevant solely to the disadvantages of a particular strata or region but to groups and institutions that are widely and either favorably or unfavorably represented throughout society. It may mean, and there is a good deal of evidence and theory to substantiate this, that to obtain meaningful changes among the lower socio-economic classes requires subtle and complex changes in the upper levels of society. These changes relate especially to the conduct of organizations and institutions and, thereby, to the ideas and values which shape this conduct.

The older reformist and simplistic notions of income redistribution, cooperative movements and private charity seen as ways of improving conditions for the poor have little relevance to contemporary change and social policy. Underlying these notions is a tacit rejection of the multi-dimensional class structured urban society with its complex organizations and scientific technology; a rejection of the very changes and pressures that call for responsive social policy.

In sum, this brief description and assessment pictures a growing and dynamic situa-

tion. The number of behavioral researchers in all institutional settings have increased greatly in the last decade. This is paralleled by a rise in the number of research institutes and other organizations that are annually producing a quantity of empirical studies and surveys. It should also be mentioned that nearly every behavioral science discipline now has its own Canadian journal if not professional association. Canada is thus developing, belated though it may be, a substantial behavioral research community. It is one that can make a major contribution, through research and counsel, to our society.

To many however, Canadian research in the behavioral sciences is not developing fast enough. What is needed, these concerned observers feel, is greatly increased financial support for research. This paper has argued that that policy prescription while necessary is not adequate. It fails to take into account the emerging interests of behavioral scientists and the problems they face in doing research. It is these interests and problems that shape research trends.

The emphasis on added financial support to behavioral research, I feel, leads to doing more of the same. Such an emphasis is too undirected. What we should be doing is endeavoring to shape more carefully the trends already latent in behavioral research.

This can be done by taking into account, through grants, contracts, and policy, the demonstrable interests of researchers in the phenomena of change and their willingness to work in areas contributing to its direction. To do so we must face squarely the problems of organization. By and large, I have argued, these present forms of organization are not geared to large-scale research oriented toward social purpose or action.

In the last section, I have tried to show the way in which social policy and research interact. Research trends are shaped through this interaction. By this example and many others that could be described, it is possible to establish a social science policy more sensitive to research trends and needs. Policy formulated in such a way could better contribute to the building of a more human society in Canada.

APPENDIX "41"

SOCIAL ASPECTS OF SCIENCE
POLICY

Dr. O. M. Solandt

Remarks, delivered at the Round Table on the
Social Aspects of Science Policy,
under the auspices of
the University of Toronto
Harry M. Cassidy Memorial
Research Fund,
27-29 March 1969, Toronto, Canada

March 27, 1969.

I have so many things that I would like to say to you and so little time to say them and they are all so inter-related that I hardly know where to begin. The old-fashioned sequential method of presenting what I have to say seems most inadequate for the subject and the occasion. I wish that I could suddenly immerse you in what I want to communicate so that you could absorb it all at once. I even consulted that arch enemy of linear information transfer, Marshall McLuhan, but got no help. I will just have to try to start at the beginning and hope to get to the end in time. What I have to say will be telegraphic in style and incomplete in content but I hope it will convey to you my principal concerns about the social aspects of science policy. There is no time to argue about definitions of science and of policy. I will use 'science' to include the whole of man's organized knowledge about himself and his world and 'policy' to mean an authoritative statement of purpose or, even more explicitly, an outline of a general strategy aimed at achieving stated goals.

Certainly throughout the industrialized world men now realize how powerfully advances in science and technology can change their lives. They have also come to recognize that some of these changes are good, some are bad, and many are equivocal. As a result some people regard the scientist as the great leader of the modern age while others consider him to be the source of much if not all the evil of our times. The one thing on which most people agree is that our social customs and institutions are not changing nearly fast enough to adapt comfortably to these changes in technology.

As a result of this concern most of the industrialized nations how now set up some

mechanism through which scientists can advise the government on the formulation of a national science policy. In almost all cases this body has dealt primarily with the natural sciences and engineering and only indirectly with social sciences. It is almost as if we had decided that the best way to make up for the slow adaptation of our social systems was to control the rate of discovery and application of new scientific knowledge. Discussions of science policies seem largely to overlook the distinction that Sir Geoffrey Vickers makes in his paper between natural order and man-made order. Man has made tremendous strides in getting the most out of his natural environment by adapting his own activities to the order that he finds in the natural world. The Apollo flights are probably man's most spectacular achievement in this direction. On the other hand, we have given far less attention to the man-made order that we have created and that we can learn to change to meet our changing needs.

If mankind behaved we would expect to find him devoting the larger part of his exploratory efforts to trying to find out how to adapt the man-made order to make best use of the continual stream of new knowledge concerning the natural order that comes from scientific research. Unfortunately, this is not true; we spend more and more time and effort exploring the natural world and converting the results of our discoveries into usable technology which further perturbs our already turbulent man-made order.

My experience suggests that this is more than merely a neglect of social sciences. It is an actual revulsion from them not only by the natural scientists and engineers but also by politicians and voters. The natural scientist is

viewed by many with fear and distrust both because of the terrible weapons that he has discovered and because so many of his discoveries such as the computer lead not merely to benefits for some but also to feelings of insecurity for many. Similarly, the social scientist is viewed with suspicion by the natural scientist partly because in studying human behaviour he is tending to probe some of the sensitive areas of natural science. After all, natural science has been built on man's ability as an observer and a critical examination of his performance can raise some difficult questions. In addition, many natural scientists and engineers are doubtful about man's ability to apply the scientific method to social problems. They feel that there are too many variables and too much that seems totally unpredictable. I do not share this pessimism. Social problems are usually more complex and difficult than physical ones but careful study will increase our understanding of them.

The ordinary man in the street often distrusts social science because it seems to be prying into his private life. The politician fears social science because it may undermine his position as the interpreter of the will of the people. Clearly one of our most urgent problems is for the natural and social scientists to establish a common ground from which will grow a new and broad study leading to a better understanding of human ecology. This must include not only a study of the interactions of the natural and social sciences but also a study of how knowledge in both of these fields affects society and how it can be communicated effectively to voters and especially to political leaders. Such an improvement in mutual understanding can be achieved and is possibly our most urgent need.

My own view of our present position may be naive but it is certainly definite. I feel very strongly that man is not using his vast knowledge of the natural world nearly as effectively as he could. His failure to exploit this knowledge lies mainly in his unwillingness to study social organizations and to understand how to adapt them to change. What we need to do is to find out how to devise a social structure which can not only make immediate and effective use of our present knowledge of the natural world but can also adapt rapidly to future additions to our knowledge. Obviously, such a social structure will only come as a result of a

major program of research in the social sciences that will provide us with a better understanding of the man-made world to match our growing knowledge of the natural world. All this must be achieved in a society that gives increasing emphasis to human values. The goal that I see is a society that is prosperous and efficient because it embraces science as an integral part of its culture and uses technology efficiently and concurrently to use this prosperity as a basis for creating the 'just society' that we talk about.

As the Science Council has struggled with the problems of advising on a national policy for the natural sciences and engineering, we have become more and more convinced that the principal blocks to progress are institutional and organizational. Starting at the top; there is no effective focus for bringing the knowledge of sciences both social and natural, to bear on either the day-to-day or the longer term problems that face the Government. This does not mean that the Government does not use science in its work. The Canadian Government has on the whole done quite well in this field but there is a lack of coordination and planning for the most effective use of science. At the next level, we find the rigid structure of Government departments interfering with the free evolution of mission-oriented teams. In addition some Government agencies such as part of the National Research Council lack clearly defined missions.

In the universities the fragmentation of knowledge and effort by the rigidities of the departmental structure are serious. Those of you who have lived in universities may have come to accept these sub-divisions as essential but they come as a shock to any student of organization. They are beginning to break down but far too slowly.

In industry the situation is no better. Only a few Canadian firms make effective use of the knowledge in the natural sciences and engineering that is readily available to them and fewer still make any use of similarly available knowledge in the social sciences.

Our short range goals seem quite obvious. We must devise in Canada a means for providing well thought out advice that will enable the government to formulate an integrated policy for the use of science both natural and social in the interest of the nation. In an ideal world this advice would be given to the government. The government would then formu-

late and state its policies and each major segment in society would then devise sub-policies consonant with the broader national policies. Unfortunately ours is a very imperfect world and we cannot wait to do things in such a logical sequence. Universities, government agencies and industries must each begin by re-examining the ways in which they use science and formulating their own provisional policies for using it to greatest advantage. Hopefully, the Science Council and of her advisory bodies at the next level of organization will be able to take all this work into account in formulating their advice to the government. Science policy whether for the natural sciences and engineering or for the social sciences must be made at the political level. Science is just one of many factors that leaders must take into account in allocating scarce resources of money and manpower. It is up to the scientific community to ensure that the politicians have before them and thoroughly understand the best possible advice on the contributions that science can make to national goals when they are making these hard decisions.

At this point in preparing my speech I was just about to say that speaking from the biased viewpoint of a natural scientist I feel that there is a great need for a more integrated outlook on the part of social scientists. On thinking that over, I am not sure whether I am really a natural scientist or not. I was trained in physiology and medicine which certainly border on the social sciences. I spent a great part of my working life on operational research and I have always defined 'operational research' as an attempt to apply the general principles and methods of science to the solution of problems arising during the operation or functioning of complex systems of men and machines. During all this period, I have been just as much concerned with the functioning of the men in the systems as with the machines. In fact, it seems to me that this attitude, if more widespread, might begin to solve many of our problems. Our whole modern society can be regarded as an infinitely complex system of men and machines. We spend far more time understanding the machines and their mechanism than we do on understanding the men and their interactions with the machines so maybe I'm not as prejudiced as some. Nonetheless, I will admit bias in suggesting that, before we can make real progress in a team attack on the problems of science policy, the social science community in

Canada must get itself better organized and think through its problems of contributing toward the formulation of science policy. This conference is not only clear evidence that you are aware of this need but it will also make an important contribution toward understanding what remains to be accomplished. In saying this, I do not want even to suggest that the natural scientists and engineers have solved all their problems but they are struggling valiantly with them. Both branches of science will go ahead more rapidly as they begin to work together more closely and better understand each other's problems and viewpoints. As I am sure you are all well aware, an important new area of contact between the branches is now opening up, especially in the United States. Several large aerospace, electronic and systems research groups are exploring the possibility of applying their accumulated skills and techniques to helping in the solution of pressing social problems. This is a very important development but it has its dangers. I hope that social scientists, where they have an opportunity, will cooperate fully with these enthusiastic newcomers but will warn them of the pitfalls and difficulties of research in the social sciences. I am sure that they have much of value to contribute but fear that they have an unfortunate tendency to oversimplify complex problems in order to make them fit their elegant analytical tools. There is nothing more troublesome in research than a scientist who has solutions and is looking for problems. You must try to convince them that the complexities are an essential part of the problems and that models must be firmly based on carefully collected and analysed facts.

When the Act to set up the Science Council of Canada was being written, science was defined as the 'natural sciences and engineering'. This definition was removed so that the Council could, should experience show that this would be a good idea, include the social sciences as well. I have been gently pushing to have the social sciences included but have met with very little enthusiasm either within the Council or outside. It seems to me that the social sciences must be brought into policy formation at the highest level quite soon. There are two obvious ways of doing it. One would be to dissolve the existing Science Council and reconstitute a new one with equal representation of the natural and social sciences. At one time, I was quite enthusiastic about this idea but have gradually come

around to the view that a second possibility would be more desirable. This would be to set up a social science policy council exactly parallel to the existing Science Council which would then have an appropriately changed name. At the same time, provision would be made for ensuring coordination between the two bodies. This could be done by having a small executive committee with equal representation from the two councils which would meet regularly to coordinate actions. In addition, I think the staffs of the two councils should be co-located in the same building and the two councils should meet jointly at least once a year.

Such an arrangement might well be more effective than a single council at the present time since the kinds of change that are needed in the two branches of science are quite different and there is nothing to be gained from them trying to keep exactly in step in evolving new strength in their respective fields. Such an arrangement would also give time for the two groups to get to know each other in less intimate circumstances than if they were pushed together in a single council.

In addition to this cooperation at a top level we could begin immediately, and in fact

are beginning, some collaboration on specific mission-oriented tasks. For instance, a recently completed study of the support of research in the universities was done in collaboration with social scientists and humanists and covers all fields of research. Also, in examining problems of cities in order to recommend a point of attack, we are working closely with social scientists. There are many other areas in which collaborative action, both in research and in application of existing knowledge, could be extended immediately. But though these practical problems are important, I would think that a systematic examination of the institutional rigidities of modern society may prove in the long run to be more productive. I hope and believe that a great deal of discussion at this round table will be focussed on these institutional problems and that out of the discussions may come some effective proposals for action. We must aim to remodel the institutions of our society at almost every level so that they will not only be better adapted to the use of science for the welfare of man but will also be better adapted to the never-ending change that we know science will continue to induce in our society.

APPENDIX "42"

PARTICIPANTS SPEAK OUT

Highlights from Workshop Reports

Rapporteurs:

Robin F. Badgley

Francis J. Bregha

March 28, 1969

Science policy depends on social policy. Canadians, the participants concluded, have paid insufficient attention to defining social policy with respect to the major historical forces now changing and disrupting our society, forces which are evident in much of the frustration and alienation most visibly expressed by young people, and perhaps, ultimately, caused by advances in science and technology.

We recognize, in summarizing the discussions of the several workshop sessions, the difficulty in accurately representing the numerous points which have been voiced, but we have depended for our general conclusions on the reports prepared by the chairmen and the reporters of the workshops.

GOALS AND POLICY

Starting from the premise that science should provide "a guide and a critique for social policy", a major recommendation was made that science should assist in the articulation of a people's needs and aspirations. The goals should be more than a mere statement of general aims, but should reflect the specificity and feasibility of attainment, the ability to be communicated to all interested groups, and should include a provision for a regular re-assessment.

The goals and their formulation should focus on the following questions:

- (a) what is their relation to the science policy expected to implement them?
- (b) what are the priorities?
- (c) what is the co-ordination machinery for their implementation?

Because of the gap between the concern expressed in the formulation of goals and the policy supposed to implement them, there is a pressing need for a co-ordinating body on the

national level, particularly to identify the major research requirements and to plan the overall strategy.

Science policy, in its descriptive and prescriptive aspects, should respect free inquiry and encourage private research because many scientists feel divorced from those who formulate ultimate policy decisions, special concern was expressed for adopting an overall policy that would enhance the transmission of accurate scientific information to political leaders.

PROCESS

While the importance of goals for science and public policy was generally recognized, many were concerned about the necessity of refining the process of setting goals. This process should involve all scientists, frame relevant questions for public discussion and provide a monitoring of implementation, so that the process of feedback would permit appropriate modifications in the setting of goals.

Many were concerned about the time span required by such a process as well as about the interval between the setting and the achievement of goals. Social scientists, it was suggested, should be able to plan for 25 to 30 years, instead of being forced into crash programs resulting from inefficient past policy decisions.

STRUCTURE

Recognizing science policy as the implementation of social policy, the participants agreed that a greater degree of interdisciplinary planning, co-ordination and communication was desirable. More attention than hitherto should be given to devising flexible, effective organizational structures for the setting of goals, the formulation of public poli-

cies, their monitoring in establishing the allocation of scarce resources.

Specific recommendations about the structural or institutional setting in which science should be integrated with public policy included:

(i) A national body—a “watchdog” committee should be established for Science and Society which would operate independently of political or specific parochial professional considerations.

(ii) Scientists in greater numbers and with adequate support and resources should be added to all government departments. This step would ensure ready access by policy decision makers to expert advice as well as ensuring confidentiality of such advice.

(iii) Prestigious non-governmental advisory panels consisting of professionals of various backgrounds should be established.

(iv) On each of the foregoing advisory committees, representatives of the general public should be present which would alert the scientist of whatever background to the perspective of the citizen, and concomitantly, result in education of the public in scientific affairs.

QUALITY CONTROL

Although scientists are not exclusively responsible for the consequences of science, they bear a unique responsibility. Because of their ability to predict the consequences of their research which may not be readily apparent to the layman, scientists should adhere to the norm of openness by bringing the possible social consequences of their endeavours to the attention of the public. The creation of a critical journal for the study of the social consequences of technological progress and scientific innovations should be considered, in

addition to frequent interdisciplinary meetings dedicated to the same purpose.

INTERDISCIPLINARY COLLABORATION

The dialogue between the social and natural sciences constituted a major theme of the Round Table. Discussion revolved around the current status, the conceptual relevance, the methodology and the relevance for application of the various sciences. Despite divergent viewpoints, there was a thread of consensus that the social sciences, in Henry David's analogy, were “the best other science that we had”, and as such, were an indispensable force in examining the impact of government policies.

There was unanimous agreement that there should be a broader interdisciplinary involvement at all levels—in scientific training programs, in the formulation of research projects at every stage of development, in the establishment of interdisciplinary institutes, in the critical appraisal of research enterprises and in the evaluation of public policy.

ALLOCATION OF RESOURCES

Given the vastness of our social needs and the scarcity of resources devoted to their study, the participants urged a re-examination of the priorities in allocating public funds for basic research. More specifically, it was recommended that greater emphasis be given to training and research in social sciences. It is only on the basis of a comprehensive view of our rapidly changing society that sound public policies can be formulated. The allocation of public research funds does not favour the social sciences. While in no way seeking to diminish the funds going to research in natural sciences, participants urged that increased federal funding should be given for training and research in the social sciences.

APPENDIX "43"

THE GENERAL GOALS OF SCIENCE
POLICY

The Honourable Maurice Lamontagne, P.C.

Address

delivered at the Round Table on the

Social Aspects of Science Policy,

under the auspices of

the University of Toronto Harry M. Cassidy

Memorial Research Fund,

27-29 March 1969, Toronto, Canada.

It is very difficult to have a useful discussion on the goals of science policy without first reaching some common understanding on what ought to be the general relationship between science and society, between the scientist and the politician. The debate on the moral and social responsibility of the scientist is an old one. It dates back at least to the Hippocratic Oath, as Sir Karl Popper noted recently. It was renewed with great vigour after the first atomic explosion and the Viet Nam War has kept it very much alive. The debate on the responsibility of government towards science and the scientist is much more recent, but perhaps even more far-reaching.

It was precisely at the height of the first and old debate, after World War II, that the State began to offer substantial sums of money for scientific research and that a rapidly increasing number of scientists began to seek or at least to accept the grants and the jobs offered by government. Thus, while discussion in academic circles was concentrated on modern versions of the Hippocratic Oath, the seeds of the second debate were being sown by the new and unobtrusive connivance of the politician and the scientist. It is not my intention here to even attempt to make a serious contribution to the discussion of that topic. Don K. Price, among others, has done this remarkably well again in a recent article entitled "Purists and Politicians". I only want to recall briefly, through an analogy, the changing character of the relationship.

The "Mariage de Raison" Between the Politician and the Scientist

The new alliance between the scientist and the politician appeared at first to the scientist as a convenient "mariage de raison". He was himself in the role of a new wife still free to pursue her old and only true love but lavishly supported by a busy husband involved in the strange and dubious activities of politics. This curious marriage was a happy one for many years, at least in Canada. Dr. Steacie could say in 1958: "We are, in fact, one of the few countries which has recognized the fundamental fact that the control of a scientific organization must be in the hands of scientists". And he added that NRC had "enjoyed far-sighted treatment from the governments of the day which have left it free from many of the normal aspects of government control and interference." This freedom and generous support also applied to most other government research establishments and assistance programmes.

In recent years, however, the mounting cost of research together with other pressing financial problems have forced the government to review its own role as the benevolent and unsuspecting husband, in the "mariage de raison". For instance, it refused to pay for certain pieces of equipment such as the intense neutron generator, not so much on the ground that it would not have been nice to have them in the household, but because they were just too expensive. The expenditures of the Canadian government devoted to scientific activities have nearly tripled in the last ten years and reached about 600 million dollars in 1967-68. Such a big science budget could not

be left free from "the normal aspect of government control and supervision".

Moreover, it became evident that the true love of the scientist was not always pure and that it could produce offspring which had a tremendous impact, good or bad, on economic prosperity and the general well-being of society. Governments began to realize that they had discovered a hen with golden eggs. Indeed, one of the main features of the third major technological revolution, which appeared in the late 1950's, as that science and technology had become key factors of economic growth, higher productivity and social improvement. The anticipation of tremendous new potentialities for war and peace marked the beginning of the international scientific race which is likely to go on forever. No country will want to opt out of that race, unless it is prepared to face the consequences of a widening technological gap, to sacrifice its growth and affluence, even its security and survival.

What happened in recent years was quite paradoxical and unexpected. Initially, the scientist had reluctantly accepted the "marriage de raison" proposed by the politician. As years went by, however, he had become more secure and convinced that he had succeeded in negotiating an acceptable relationship with the government, which enabled him to get funds and remain free. After a long period of happy marriage, he now discovers that it is the politician who is becoming reluctant and who wants to re-define the relationship. At the beginning of married life, the politician had not interfered because he was under the impression that the scientist was inexpensive and not too fertile, in terms of practical results. But the researcher made the fatal mistake of becoming more fertile and more expensive. Thus, he was forcing the politician to exercise a greater control over the science budget and to look more closely at the research output to make sure that it served the public interest. In other words, the scientist through his own practical achievements, is now obliging the government to have a science policy. And he finds that he has become the prisoner of an alliance which he would probably not have accepted at first but that he cannot break any more because he needs public support to remain a scientist.

Under the new circumstances, the days of the "marriage de raison" between the politician and the scientist where both parties

could ignore each other, are over. The new relationship will become an imposition or, let us hope for the benefit of society, a love affair. But, for this to happen, the politician will have to respect the scientist and his work, to listen to his advice and his criticism. The scientist will have to accept the fact that research has become a political activity in the noblest sense of that expression, that it must be guided by national goals and subjected to a systematic policy review in the light of those objectives. Not only should he accept this new situation passively, he should also be prepared to participate actively in the formulation and the endless re-definition of those goals. In other words, the politician and the scientist must learn to become partners, not only to live together but to work together and help each other to better serve society. This integration of the scientist in society with his new responsibilities will provide to him, I am sure, a much more rewarding challenge than the classical search for the truth in the Ivory Tower of the Republic of Science. The researcher must and will remain a scientist but he will become also a citizen with important social functions to fulfil.

The Innovation Process and Science Policy

There should be, however, no misunderstanding about the implications of this new challenge. It means, in particular, that the role of science is to serve the best interests of society and that the goals of science policy lie outside the purely scientific field. The scientist should, of course, be consulted about them. He should also as Sir Karl Popper suggests, "Consider it one of his special responsibilities to foresee as far as possible (the intended and) the unintended consequences of his work and to draw attention, from the beginning, to those which we should strive to avoid" or to maximize. But, in the last analysis, the formulation and the selection of the goals of science policy properly belong to the political process.

Among those objectives, there is one which is mainly cultural and particularly close to the scientists. That is the support for basic and free research as a sector of high culture. It is widely recognized that in an advanced society, the government must encourage basic science as a disinterested intellectual activity which cannot be justified by any reason other than that it satisfies human curiosity. In this sense, basic science belongs to our cultural life and must be supported for the same rea-

sons that music, literature and art receive financial assistance. In addition, good basic science, although this is not its purpose, can often be most useful to applied research. A good deal of the technology developed since World War II originated from basic research done before that war. It should be quite clear that apart from broad budgetary considerations, this sector of science policy should be left to the scientific community, provided it is willing to apply exacting criteria of scientific merit and excellence.

With the exception of this contribution of science to culture, the major interest that society has, and therefore what the government should have in science and technology centers, in my view around the innovation process. It is through this process that society either benefits or suffers from the applications of science. It will suffice, for my purpose, to define innovation as the introduction for the first time in the world of a product, a service, a method of production or a policy. It can be economic or social; it can mean change or adjustment to change. The innovation process is highly irregular. It may begin with a discovery of basic science or originate in the creative mind of a good craftsman or a grass-root politician. In its longer sequence, it involves two main but separate stages: the scientific research and the development work preceding and including innovation and the diffusion of the new development within the economic and social system, through the innovator himself or his imitators. Science policy must be concerned with these two stages.

Our society gets the practical benefits of science and technology from the rapid and widespread diffusion of innovations. This is true even if the new development partly or fully originates from abroad. Thus, one of the most prosaic but also most important objectives of science policy is to develop a national capability and eagerness to absorb innovations. This goal, probably because it is prosaic, has been unduly neglected in Canada; the fact that it has been actively pursued in Japan largely accounts for the fantastic growth of that country during the post-war period.

I would like to mention here only two programmes which are essential to attain this objective. First, it is necessary to develop and maintain, within our society, a balanced superstructure of scientific manpower, including managers, competent enough to sustain

our national research effort but also to use the results of R and D, whether originating at home or abroad, for the economic and social advantage of the nation. To satisfy this need, scholarships are required to fill certain gaps and grants to free research in universities are necessary. Nowadays, it is essential for a university student to be exposed to research and for a good teacher to be also a good researcher. For instance, Dean Leclair of Sherbrooke University told the Senate Special Committee on Science Policy that all faculties of medicine in Canada would have to close, for reasons of incompetence, if the Medical Research Council were to stop its financial assistance to research.

This sector of science policy is closely related to education and training. That is why it should remain an area of free research and why, within each programme, the criterion of scientific merit should prevail. And it should apply not only when an application is considered but also when a project is reviewed and completed. It would however, be highly desirable if research projects in each field could be fitted into a national pattern or plan. Moreover, the various research and training programmes must be appraised and co-ordinated in the light of broad national requirements. Otherwise, some academic disciplines, like the social sciences, may be neglected and unable to meet the needs of our society and the supply of scientific manpower may become unbalanced, as it may be now in Canada.

Secondly, our national capability to absorb innovations and to innovate could be greatly enhanced by a central information service on science, technology and innovation. Such a service should be a look-out institution; it would gather pertinent data on new developments, both at home and abroad, disseminate that information within our country, and make sure that this information will be properly evaluated and used when practical. As I said before, what is important for our growth and well-being is not so much to innovate ourselves but to be able to quickly absorb and exploit useful innovations. Our inability to do that in the past has caused delays in our industrial development which are well known to economic historians. The proposed look-out institution would not only be useful for this purpose but it would also put us in a much better position to define the direction and content of our own research effort.

I have briefly reviewed two major objectives of science policy. It should enable pure science to enrich our cultural life and develop a national capability to absorb and diffuse innovations quickly. Between these two extreme goals, there is another one which consists in improving and sustaining our ability to innovate. There are at least three reasons why a country must innovate or contribute to the process leading to innovations. First, if a nation has the right to imitate and apply to its own needs the new developments initiated by others, it has also the obligation to contribute to the international pool of discoveries. Secondly, there are usually important national gains to be derived from being first in introducing an innovation. Thirdly, a nation has always specific features and problems requiring special attention and therefore, it must innovate to meet its particular situation.

The Social Aims of Mission-Oriented Research

The sector of mission-oriented research and development is certainly the most important in terms of private and public expenditures in Canada. It covers the bulk of scientific activities pursued by government and industrial establishments. In this respect, at least, we are surely meeting our international obligations. But our concept of mission-oriented research may not have served our national goals as well. It is not sufficient to define this type of research merely by its subject-matter, as being confined to a sector or a problem, such as forestry, health, agriculture or urban environment. But some government research establishments seem to interpret their mission only in this way, so that they view basic research sought for itself or applied research as being as essential to fulfilment of their role, provided it is within their field of interest, as more practical development work leading to tangible results. This is probably why Canada spends a much higher proportion of its science budget on research as opposed to development than the United States and the United Kingdom.

Mission-oriented research and development should not be limited only by its special subject-matter. It should also be governed by its goal which is economic and social innovation. This is precisely what distinguishes it from curiosity-oriented research, where scientific achievement is an end in itself. Thus, basic or even applied science does not constitute an

essential part of the role of mission-oriented research agencies. It is an instrument or a means which should be utilized only when it can be useful and when there is good reason to believe that it will lead to innovation. To say that the essential purpose of mission-oriented research is innovation, defined in its broad sense to apply both to the market place and to the nonmarket sector, may sound trivial. However, this proposition when accepted as a major goal of science policy, has in my view, a lot of significance.

If the justification for this type of scientific activities is to lead to and produce innovation, it follows that the merit of mission-oriented programmes and the performance of the agencies initiating them must be appraised in that light. This means that in measuring the output of these establishments, only the value of the innovations which they have introduced or helped to develop must be taken into account. The results of basic and applied research, although they may have scientific merit and enrich our cultural life, should not be considered as part of the output of these institutions, unless they are used by someone else in the country to innovate. These results are at best by-products and they may be a good indication, if they are much more important than practical applications, that the agencies concerned have lost sight of their innovation-oriented mission. For this reason and others, the number of articles produced in these establishments and published in scientific journals is not necessarily a very good measure of their output and their performance.

It would be interesting to look at this sector of our science effort with the perspective of the innovation process. We might find that innovations made in Canada have been very costly when compared with the total investment devoted to mission-oriented research. We might also discover that this relative failure is not due to our lack of creativity as much as to the absence of opportunity to innovate in industry and to the deviation of government research agencies from their true mission.

If this criterion of economic and social innovation is valid, it should not only be applied "ex post", to appraise the past and current performance of our mission-oriented research effort. It should also, and above all, be used "ex ante", to plan our future scientific activities, to decide their direction and

content and to determine our priorities. Proper planning in this field requires answers to at least three questions. First, what chances do we have to innovate if we continue or initiate a research programme, given our own know-how as compared with that of other countries? Secondly, if our chances are good, what are the probable economic and social benefits to be derived from that innovation in relation to its costs? Thirdly—and this is most important—what are the most pressing economic and social areas where we must innovate to meet our particular situation, because nobody else is going to do it for us? The first two questions are mainly related to fairly specific projects and programmes and to innovation in the market place. The third one refers generally to what Michel Chevalier has described as “meta-problems” and to innovation in the non-market sector. It covers the broad area surveyed by the Science Council in Report No. 4 and defined by Professor Trist as “problem-oriented research domains”.

I do not intend to review, at this late stage, what has been said about this new but most important sector of science policy. Before concluding my remarks, however, I would like to underline two points in this connection which have some relevance to the Canadian scene and to our current national debate on science policy. They are rather obvious but perhaps they need to be re-stated as we reach the end of our proceedings.

First, our new interest in problem-oriented research should not make us forget that there are other important sectors of our science effort and policy which also require our sustained attention. This danger may have arisen inadvertently from the special emphasis put by the Science Council on mission-oriented research. The Council will soon examine, I am sure, other aspects of our scientific activities and, as a result, I hope that the scope of our national debate will be extended. We must re-appraise the encouragement given to fundamental science, to scientific excellence and to research in Canadian universities. We should review our scientific manpower training programmes in the light of our future needs. We must discuss the desirability of establishing better information services and look-out institutions specialized on science, technology and innovation. We have to look very seriously at the weakness of our industrial research effort and try to remedy this situation. We should re-examine the tasks and the activities of specialized research agencies

in government, which at present receive the big share of our support to research. In other words, what we need is a careful and continuing review of all aspects of science policy.

Secondly, to come back to problem-oriented research, it is widely recognized that it requires a multi-disciplinary approach and, as Professor Trist says, an integrative strategy, not only when it is carried out but also when its specific goals are defined, when its domains are identified and its priorities selected. At these various stages and in varying degrees, problem-oriented research requires the joint effort of natural, life and social scientists. But in Canada, there has been no serious attempt yet to organize this joint effort. The occasions given to our scientists from different disciplines to meet and work together have been extremely rare. The dialogue between them has not even begun, except at this Roundtable which, I believe, has established a precedent in Canada.

When this meeting of minds really begins to take place in our country—and the sooner the better—I hope that it will not degenerate into a “dialogue de sourds” which has been so aptly described recently by Andrew Shonfield as follows:

“When social scientists and natural scientists meet to discuss the future one is struck by the way that each group adopts towards the other a “mock-humble accusatory tone, the accusation being that the other’s role is the decisive one. The social scientists say: ‘If you would only tell us clearly what kind of technological changes we can expect, we could begin to analyze how society is likely to change.’ To which the natural scientists answer: ‘Never you mind about us; all we need are some marching orders.’ Given enough time, modern technology has an almost limitless capacity to invent—so long as society decides that a sufficient volume of resources is to be put at the disposal of any particular programme. So you just tell us what is wanted by society: that is going to be the decisive factor in shaping the future...”

I believe that such a debate between scientists in Canada would be useless and sterile. Our scientific elite will have to work closely together in all stages of research and to maintain a constant dialogue if we are to solve our “meta-problems”, to plan intelligently and to shape the society of the future so that it will

lead us not only to affluence but to happiness which is more important to human beings. And in this common venture, the social scientist will have a crucial role to play because, as Shonfield points out: "It is out of the knowledge of society, rather than of technology, that the major insights about the world a quarter of a century away are likely to come".

And yet, while the natural scientists have agreed to participate actively in the formulation process of science policy and seem prepared to have a love affair with the politician, the social scientists remain remarkably silent in the current debate and appear reluctant to get involved in the reshaping of our science effort.

This lack of participation, which is most regrettable, may be due to several causes. It may be that social scientists have developed an inferiority complex over the years, as a result of the achievements of natural scientists or that they want to remain pure in order to exercise their role of critics, more objectively. The "marriage de raison" that they have contracted with the politician, which dates back only to the creation of the Canada Council in 1957, is perhaps too recent, to be converted into a love affair.

The politician may also be responsible for this vacuum. Very few active social scientists have been appointed on the Canada Council or on the Economic Council. They are not represented on the boards of government

research establishments and they have been excluded from the Science Council, although this Council must give advice on the social goals of science policy and on the broad research domains requiring special attention. This lack of representation may be caused by a simple oversight or, more likely, by suspicion. The government may fear that by inviting social scientists to participate fully in the formulation of science policy, it will also, as Sir Geoffrey Vickers said, "call into being an informed body of critics" which may be more negative than constructive.

Whatever the reasons which account for the absence of social scientists from the process of science policy formulation, I feel that this isolation must cease. A new deal must be negotiated between the politician and the social scientists. Perhaps we should not expect that a love affair will develop between the two, but if they do not agree, on at least a practical working relationship, our science effort will remain unbalanced and the social aspects of science policy will be neglected. If society is to get the full benefits of the national research activities that it helps to finance, a new alliance between the natural scientists, the social scientist and the politician will have to be arranged and I hope that this Roundtable will mark the first phase, in the building of that essential partnership. If it does, we will have another reason to be grateful to Dr. Hendry for having organized it.



First Session—Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*

The Honourable DONALD CAMERON, *Vice-Chairman*

No. 40

WEDNESDAY, APRIL 23, 1969

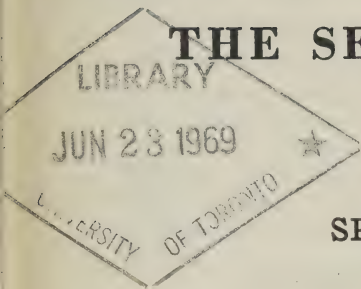
WITNESSES:

Department of Regional Economic Expansion: André Saumier, Assistant Deputy Minister (Programming); R. J. McCormack, Chief, Canada Land Inventory; Roger Tomlinson, Chief, Regional Information Systems; and Guy Morton, Consultant to the Geographic Information System.

APPENDICES:

- 44.—Brief submitted by the Department of Regional Economic Expansion (formerly Department of Forestry and Rural Development).
- 45.—Brief submitted by the Department of National Revenue, Customs and Excise.
- 46.—Brief submitted by the curator of Contemporary Art, National Gallery of Canada.
- 47.—Brief submitted by the Royal Canadian Mounted Police.
- 48.—Brief submitted by the National Museum of Natural Sciences.

THE QUEEN'S PRINTER, OTTAWA, 1969



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Cameron
Carter
Desruisseaux
Giguère

Grosart
Haig
Hays
Kinneir
Lamontagne
Lang
Leonard
McGrand

Nichol
O'Leary (*Carleton*)
Phillips (*Prince*)
Robichaud
Sullivan
Thompson
Yuzyk

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinneer, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,
The Honourable Senator Lamontagne, P.C., moved, seconded by
the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted
for that of the Honourable Senator Argue on the list of Senators serving
on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday,
February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Hon-
ourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senator Blois, Carter, Giguère,
Haig, McGrand and Nichol be added to the list of Senators serving on
the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, April 23, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Aird, Belisle, Bourget, Cameron, Grosart, Haig, Kinnear, McGrand and Robichaud.—(10)

In attendance: Philip J. Pocock, Director of Research (*Physical Science*); Gilles Paquet, Director of Research (*Human Science*).

The following witnesses were heard:

DEPARTMENT OF REGIONAL ECONOMIC EXPANSION:

André Saumier, Assistant Deputy Minister (Programming);
R. J. McCormack, Chief, Canada Land Inventory;
Roger Tomlinson, Chief, Regional Information Systems; and
Guy Morton, Consultant to the Geographic Information System.

(A curriculum vitae of each witness follows these Minutes.)

The following are printed as Appendices:

No. 44. Brief submitted by the Department of Regional Economic Expansion (formerly Department of Forestry and Rural Development).

No. 45. Brief submitted by the Department of National Revenue (Customs and Excise).

No. 46. Brief submitted by the curator of Contemporary Art, National Gallery of Canada.

No. 47. Brief submitted by the Royal Canadian Mounted Police.

No. 48. Brief submitted by the National Museum of Natural Sciences.

At 12.45 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Saumier, André, Assistant Deputy Minister (Programming) with the federal Department of Regional Economic Expansion, was born in Montreal in 1933. He received his secondary education at the Collège de Saint-Laurent of the University of Montreal. He obtained his B.A. cum laude in 1951 from this university and was first of his year. He carried out studies in medieval philosophy in Rome (Italy) where he obtained a licentiate cum laude in 1956. Then, he attended the University of Chicago where he passed with success his Ph.D. exams in sociology in 1958. A scholarship of the Canada Council enabled him to write his Master's thesis in 1959 and to obtain the Master of Arts degree in sociology from the same university. On his return to Canada, he taught sociology and philosophy during two years at the Collège de Saint-Laurent and conducted several research projects at the Faculty of Arts of the University of Montreal. Afterwards, he went to Harvard University (Boston, U.S.A.) where he secured the title of Master of Business Administration in 1962. In 1962, he accepted the position of Research Director with the Socio-Economic Research Group of the Battelle Memorial Institute, Columbus, Ohio. He left this post in 1963 to become the first research director of the Canadian Council on Urban and Regional Research, which had been established shortly before through a major grant from the Ford Foundation. In 1965, Mr. Saumier left the Canadian Council on Urban and Regional Research to become Assistant to the Director General of the General Investment Corporation of Quebec, an investment company organized in 1964 by the Government of Quebec and some private interests. In January 1967, he was appointed Assistant Deputy Minister of the Federal Department of Forestry and Rural Development. Mr. Saumier is a lecturer in urban sociology at the University of Montreal since 1965. In 1966, he was president of the Quebec Welfare Council and of the Montreal Chapter of the Community Planning Association of Canada. He is vice-president of the Canadian Film Institute and member of the Cinematheque Canadienne. He is also, since 1967, a member of the Board of Directors of the federal farm Credit Corporation. Mr. Saumier is member of several scientific associations, including the American Sociological Association and the Regional Science Association. He is the author of articles published in Canadian and American magazines and he has contributed to several books, including "Planning the Canadian Environment" and "Une ville à vivre".

McCormack, R. J. Born near Bancroft, Ontario, Mr. McCormack served as a navigator with the R.C.A.F. He graduated with a B.Sc.F. from the University of New Brunswick in 1950 and from Michigan State University with a M.Sc. in 1951. From 1951 to 1957 he was a research officer with the then Forestry Branch of the Department of Northern Affairs and National Resources working largely on the growth and yield of red and white pine on the various

site classes on which they occur in Ontario and Western Quebec. From 1957 to early 1964 he was a consultant to an air survey company and worked on foreign assignments in Asia and South America. In 1964 he joined the Federal Forestry Department and was seconded to ARDA to co-ordinate the National Forest Land Capability program of the Canada Land Inventory of ARDA. Since July of 1967 he has been Chief, Canada Land Inventory. In addition to his responsibilities for program co-ordination, Mr. McCormack is Chairman of the National Advisory Committee on Forest Land, federal member of the Federal-Provincial Steering Committee for Newfoundland Special Resources Project and member of various national and international resource committees.

Tomlinson, R. F. Geographer, Born in Cambridge, England in 1933. Served in Royal Air Force, Flying Officer—Pilot—3 years. Educated in England and Canada. Graduated from Nottingham University, England; Acadia University, N.S. and McGill University, P.Q. Led Nottingham University Glaciological expedition to Norway in 1955, 56, and 57. Came to Canada in 1957 on \$3,000 McGill Research Scholarship. Spent first 1½ years in Labrador—Ungava. Taught geography at Acadia University 1960-61. Joined Aerial Survey Company. Became Chief Resource Management Division. Carried out data gathering and analysis for many and diverse geographical investigations varying from agricultural potential survey in Somalia to traffic flow studies in Montreal. Wildlife range studies in the Barrenlands to Coral Reef studies in Bermuda. These included work on behalf of the U.N. and Canada External Aid. Became specialist in air photo-interpretation. While with aerial survey company initiated research in methods of handling geographical data so that the companies surveys could be used. Learnt programming and related computer techniques. Joined Government under contract in 1964 to develop computer-oriented systems to handle data resulting from Canada Land Inventory. Conceived, developed and directed research leading to the general purpose Canada Geographic Information System. Currently: Chairman International Geographical Union World Commission on Geographical Data Sensing and Processing. The other six members are U.S.S.R., Germany, Israel, India, U.K., and U.S.A. Chairman Canadian Committee of Photo Interpretation and Remote Sensing.

Morton, Guy M. B.Sc. Mathematics and Natural Philosophy, University of St. Andrews 1956. 1957-1958, Programmer on 704 at Avro responsible for Computer System to simulate Avro Arrow Air Conditioning System. 1958-1959, Joined IBM, September 1958. Worked on 705 Centre at Confederation Life in Toronto on system to centralize and automate accounting and inventory systems for Canadian Oil. 1959-1962, Transferred to Ottawa, July 1959. From 1960 to 1962 was lead systems engineer at DBS responsible for installation of 705 III, 1401 and document scanner. 1962-1963, Was responsible for installation and setting up programming and operations sections of IBM 1401 datacentre. During this time was responsible for: Systems design and programming of Freimart Inventory Control System; Systems design and programming of complete accounting system for Morrison-Lamothe Bakeries; Systems design and

report on procurement in lead shipyard for DDP. 1963-1964, Studies feasibility of fingerprint searching on computer and prepared report on findings. Acted as 'Freelance' Systems Engineer. 1965-1966, Responsible for systems design of Canada Land Inventory Geo-Information System: Presented Reports to Gimrada and Acic on feasibility of computer mapping and field intelligence; was promoted to advisory systems engineer July 1965. 1966, Successfully demonstrated 1360 multiprogramming to Department of Finance. 1967, Promoted to Field Systems Engineering Manager, responsible for 20 Systems Engineers. 1968, Appointed Account Manager. Has submitted two papers to the IBM systems engineering symposium and both were accepted. Mr. Morton has also published two internal IMB confidential technical reports.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, April 23, 1969

The Special Committee on Science Policy met this day at 10 a.m.

Senator Maurice Lamontagne (*Chairman*)
in the Chair.

The Chairman: Honourable senators, after the Easter holiday we are back into business. This morning we are meeting with the representatives of the new Department of Regional Economic Expansion. I understand that most of our witnesses and guests this morning are ghosts. They have only their former titles and not new ones.

In any case, we have with us this morning M. André Saumier, Assistant Deputy Minister (Programming) in the Department. He was connected formerly with ARDA. We have Mr. R. J. McCormack at my left, who is the Chief of the Canada Land Inventory. On my extreme right is Mr. Roger Tomlinson, Chief of the Regional Information System; and on my extreme left, Mr. David Levin, who was formerly connected with the Atlantic Development Board.

All these agencies have been brought under the same roof with the creation by Parliament of this new department of Regional Economic Expansion. I think that the bill was sanctioned only a few weeks ago, just before the recess.

Without any further introduction, I will ask Mr. Saumier to make an introductory statement.

[*Translation*]

Mr. André Saumier, Assistant Deputy Minister, (Programming) Department of Regional Economic Expansion: Mr. Chairman, first of all, I should like to thank you, on behalf of the Department of Regional Economic Expansion for your invitation to appear before your Committee.

[*Text*]

Senator Grosart: Mr. Chairman, the translation system is not working.

Mr. Saumier: I was saying that I was thanking the honourable Senator Lamontagne for his kind invitation to the Department of Regional Economic Expansion to appear before this committee.

We do so with a degree of apprehension, for two reasons. First of all, we are aware of the list of illustrious scientists who have been meeting with your committee and I dare say that in many ways the kind of problems we will be talking about might not be so gripping. On the other hand, the Department of Regional Economic Expansion, is, as you mention, just recently born, so it cannot yet claim to have a definite scientific policy of research policy. This is one of the many problems we have to face and we hope that such a policy will emerge in due course.

Confronted with this difficulty when it came to preparing a brief for your committee, we thought that we might write some obituaries for our former selves—since the department is to some extent, or was, I should say, a conglomeration of hitherto separate agencies.

You will find in the documents that have been transmitted to you a statement from each of these agencies, some of which still exist legally, such as the Prairie Farm Rehabilitation Administration; and some of which do not exist any more, such as the Atlantic Development Board.

We have tried to give you in these brief reports—which are in many ways now mostly of historical interest—an over view of what these various agencies have been doing.

On the other hand, we wondered whether there was not one project in the department which would be particularly significant from the point of view of your committee. It seemed to us that what possibly might interest most of the committee would be a project which would be novel, both in concept and in scope; and a project at the same time which would be in some ways, or would

represent in some ways a first for Canada, I do say, with some feeling of pride, a first for Canada in the world. As it turns out, we have such a project over which during the last few years a fairly large amount of money has been spent, in the region of millions of dollars. This is a project which has a very clear research component, both from what we might call the conceptual and the software point of view. It is a project which should have a very considerable bearing on planning in Canada and which should also have a considerable bearing on planning in other countries.

This is the complex which we can call the Canada Land Inventory — Geographic Information System, one supporting the other and feeding it and enabling the other to be manageable and useful.

Therefore, with your permission, Mr. Chairman, I would like without further ado to ask Messrs. McCormack and Tomlinson, who are respectively responsible on the one hand for the Canada Land Inventory and on the other hand for the Geographic Information System, I would ask these two gentlemen to proceed to give to the members of your committee a brief explanation of what they have been doing, of the significance of their work, and of their prospects for the future. All of us, of course, are at your disposal to answer any questions which you, Mr. Chairman, or the members of your committee may feel they would like to ask.

I may add that the second part of the explanation will take the form of a film which we have here, but we will not proceed with the film right now.

The Chairman: This form of presentation will interest Senator Grosart very much. He is interested in these new forms of presentation.

Mr. R. J. McCormack, Chief, Canada Land Inventory, Department of Regional Economic Expansion: Mr. Chairman and honourable gentlemen I will assume that you will have read the summary for the Canada Land Inventory which appears in the brief under the red cover. I will merely elaborate a little upon it and perhaps set the background for it.

Early in the life of ARDA we felt the need of a land classification system which would permit programs, both provincial and federal, to be formulated to fulfill our then mandate, largely land consolidation, farm enlargement and resource oriented programs to raise the

income level and increase employment opportunities in rural areas. A systematic land capability survey had previously been recommended by the Special Committee of the Senate on Land Use in Canada and by the Resources for Tomorrow Conference. ARDA being new and having no vested interest in any of the particular resource sectors felt they could co-ordinate such a program in large part because of their demonstrated need.

The Canadian Council of Resource Ministers strongly approved and on October 3, 1963, the Government of Canada approved the undertaking, under ARDA of this comprehensive land resource inventory. It was decided in a calculated way that rather than ARDA undertaking the project they would encourage the provinces to do so; the departments in any particular sector of the federal Government would also be encouraged to assume the responsibility for their particular sector. This meant that ARDA merely became a co-ordinating and financing agency. This was an interesting development in many respects because it got you out of all of the narrow interests fighting each other or fighting ARDA to retain their departmental mandates and jurisdictions.

I must add in fairness that this procedure is not the easiest way and we knew even then that it would not be the easiest way administratively. However, the benefits far outweigh the difficulties.

The first need was for a soil capability program for agriculture because in those days—this is 1963—we felt that we would have a primary need for agricultural information in a program which was to have an agricultural orientation. After a series of meetings with the provinces, federal and provincial departments of agriculture, we decided to undertake a soil capability program for the “settled areas” of Canada. As you can see by the map in your brief, the red line indicates the area in which we are carrying it out—roughly a million square miles. After much negotiation, ARDA agreed to finance this program at 100 per cent, but only for additional costs. By additional costs, which may be jargon to you we mean any positions, equipment, materiel that had to add to their present establishment in order to carry it out. In the case of the soil capability for agriculture program we supported the establishment of new positions and acquisition of equipment in both federal and provincial agricultural departments.

I do not want to go into great detail, but it soon became obvious that it is all very well and good to say on the basis of agricultural capability what submarginal lands should come out of agriculture. You had to know also to what use they should be put once they are out of agriculture; thus we decided to support the classification of lands for alternative uses. The same arrangement was maintained, that is, the provinces assumed the responsibility for the work and the appropriate federal Government department accepted responsibility for the technical input and co-ordination through ARDA.

Thus in addition to agriculture we undertook programs of land capability for forestry; recreation which as you know, is assuming a major role in land use; wild life, including both ungulates (hoofed animals) and water fowl; and later sports fish which has a definite and distinct impact on recreation programs.

Of course we realized we would have to compare potential or capability with present use in order to bring about programs to correct land use practices; thus present land use mapping was undertaken. The four western provinces undertook the land use mapping of their provinces; for Eastern Canada, that is Ontario east, the Department of Energy, Mines and Resources assumed responsibility for the mapping of present land use.

It may be worth mentioning, as a background again, that we believed that the one to 250,000 scale would be adequate for planning and this is the scale we were originally prepared to support. In our meetings with the provinces they took the attitude that they wanted a much larger scale. A compromise was arranged in which we agreed to support the mapping and gathering of the data at a scale of one to 50,000, or close to one mile to the inch, for the base maps and these would be generalized for publication at one to 250,000. As I recall, you have received examples of the soil capability for agriculture, forestry and recreation. These series of maps are being published at the rate of approximately 150 a year.

I do not want to presume upon Mr. Tomlinson's presentation, but I will put the geographical information system into context with the Inventory. It soon became obvious that this massive amount of data—roughly 20,000 maps at the one to 50,000 scale—would be extremely difficult if not virtually impossible to utilize fully without some computerized

system to handle it. We felt the need for such a system very early in the program and undertook largely by means of contracts, to devise a system which could input maps on magnetic tape. Our interest of course was primarily to enable the multiplicity of comparisons of data which we would need. The program is still ongoing. We operate under an authority of \$18 million from the Treasury Board. Even our estimates five years ago will not prove too far out.

The other phase of the program which I should explain is the land use planning phase. Once the data began to accumulate each of the provinces felt that they would like to utilize the data to undertake land use planning projects for land use rationalization and development in various areas. We felt and still feel that the \$18 million would be very unwisely spent unless and until actual land use planning were carried out in the provinces, not on an academic basis, but in a real sense of utilizing these data for development plans. In November of 1967 a policy was announced of support for land use planning projects either in association with special rural development areas, such as the FRED areas, or for other ARDA rural development areas, as in northern Alberta or as in the case of British Columbia, for land use development. Just this week we have received the first map showing a land use plan—a macro plan if you wish—that is blocking land by potential uses from British Columbia and I have asked the secretary to distribute it to you. This illustrates one use of the data in formulating a land use plan. If any of you are from B.C. this is a bit of a hot political document, but fortunately it is not hot politically from our point of view. The B.C. ARDA Cabinet Committee and the Deputy Minister's Committee have announced that this will be the basis of their land alienation program in the Prince George special sales area and, as you can imagine, they are getting many representations—presumably those who are happy are not saying anything and those who are unhappy are.

Mr. Chairman, this is roughly supplementary to the brief. I will be pleased to answer questions, but other than that I do not plan to say anything more.

The Chairman: Thank you very much. Would you like to add something, Mr. Tomlinson?

Mr. Saumier: Before Mr. Tomlinson speaks, I would like to say this. In other words, what

we are in the process of assembling under the CLI, the Canada Land Inventory, is a unique body of data reflecting both present land use throughout the settled parts of Canada and desirable or potential patterns of land use. We have this now for a large part of the country and the effort will shortly reach its conclusion. At that point we will know what the present land use patterns are in Canada. We will know what sales for these same areas and the potential for agriculture, forestry and so forth. This effort as was mentioned by Mr. McCormack, is done not by ARDA; it is done through a joint effort of the federal and provincial governments. This will result or will yield to these several governments for the first time in the history of Canada a complete coverage of both the actual and desirable land use patterns.

One might say that the next step is to try to transform the present land use patterns into the most desirable land use patterns as revealed by the various potential capabilities. I think it is fair to say that it is the first time that any country that we know of has been able to carry through this kind of massive effort.

The next step, then, in implementing the policy implications of this massive research exercise is first of all in the abstract to reconcile the alternative land uses for a given piece of land. It is quite clear that the same piece of land, while theoretically suitable for perhaps agriculture, forestry and recreation, cannot be used for three or four purposes at the same time and therefore somebody must make a decision as to its use. This therefore is the essence of the policy decisions which have to be made by governments following this research, and this kind of decision, as has been indicated by Mr. McCormack, was reached recently about a small area of British Columbia. In time that process should gradually increase, and I assure you that this kind of decision-making by government is not all an easy process.

The second step, having defined the actual land use and taking into account the possible conflicting uses of land, is to move from one to the other. This is something again which does not happen by itself. It may require, for example, taking land away from agriculture and then you have to offer alternatives to the people who are farming. It may include recreational development or forestry development. There is a whole series of shifts, physical, social and economic which must take

place. The next step is to arrive at detailed land use planning to know exactly what this particular small piece of land should be used for, and then you set in motion a series of processes whereby you will make it possible to realize in the real world the kind of desirable land use pattern that these investigations have shown to be worthwhile.

Underlying all this is, of course, as was said by Mr. McCormack, the need to have an instrument which can accept all the data generated by the CLI, analyse it and manipulate it. It was mentioned that we have 20,000 maps and so on and Mr. Tomlinson will shortly address himself to that point. What the geographic information system has done is to go beyond the requirements of the CLI itself. It goes away beyond that in that it can handle any kind of geographically based data. It is a system which has been designed essentially not so much by the collectors of data as by the users of this data. This is a fairly significant difference. It is a system which is action oriented and is designed to analyse data in a way which is acceptable and useful to those who have to reach decisions based on this data.

Having said that, I would like to ask Mr. Tomlinson to expand on the geographical information system.

Mr. Roger Tomlinson, Chief, Regional Information Systems, Department of Regional Economic Expansion: Mr. Chairman and members of the committee, my presentation this morning will be in two parts; the first part will be a brief film which takes 22 minutes and which will give you some idea of what is meant when we speak of a Geographical "Information System." Following the film there will be an equally brief presentation by a past member of our staff on the research which has gone into developing the capabilities of handling information that you will have seen in the film.

As a note of introduction I can say that the development of methods to handle the masses of information which are portrayed on the maps has been very much a research task. There was no methods of handling information or maps that were significant to us prior to the start of this research. The research has had a uniquely Canadian character to it in that Canada is a very large country spatially. When we have to have a look at and understand the land of Canada, we have to gather a lot of information on maps because it is such a large country. We have relatively few peo-

ple in Canada particularly trained geographically-minded people to analyse this information. Because of this there is an obvious Canadian research task of devising methods of handling map data. This Canadian problem has been tackled. The answers were conceived in Canada by totally Canadian staff. Something like 450 man-months of research are now involved in this project.

While we had the most obvious and pressing need for this type of research, the techniques which have been developed can be exported to any other country which needs to look at and analyse its resources data in an efficient manner. The technologies which we have developed are definitely exportable to any country which has an interest in understanding and developing its resources. I think it is true to say that the techniques that we have developed are two years ahead of any comparable development anywhere in the world. Recently in Australia I had the pleasure of hearing a delegate from the United States who was in charge of a similar sort of operation in the United States army stand up and say it is impossible to take two maps, put them in a computer and compare one with the other. I had the privilege immediately afterwards of standing up and inviting him to Canada to watch it being done. It was a very pleasurable moment.

We have had remarkable international interest in the work we are doing. Recently UNESCO has contacted the UNESCO representative in Canada and have asked if they can sponsor a conference in Canada in 1970 on geographic information systems based on the work we are doing here. The Australian Government has sent one of its people on a six-months' leave of absence to work with us here on an exchange visit. France is making diplomatic approaches to us now for a similar exposition of this particular work. I think that without any more ado we will move on to the film so that you can perhaps better understand what we have done.

(Showing of film)

Mr. Tomlinson: The second part of the presentation on the Canadian Geographic Information System will be given by Mr. Guy Morton, consultant to the Geographic Information System. I want to try to outline the nature of the research task that lies behind the system that gives you the capabilities that you have seen on the screen, and I think that if Mr. Morton tells us a little about how the system actually worked and how it actually

takes the maps and turns them into numbers, you will realize and better understand some of the problems that have been overcome and some of those that still remain to be overcome.

Mr. Guy Morton (Consultant to the Geographic Information System): Mr. Chairman, members of the committee, the Canada Geographic Information System is a computer system to read, store, analyze and compare maps. These maps may be census maps, soil maps, recreation maps or really any other kind of map since the type of map is not of consequence to the system.

The system can be thought of as basically being in three parts—the input procedure, the map reduction system which puts the data in a form used by the third part which is the retrieval system. I hope to be able to give you some idea of the complexity of this system by briefly describing each of these sections to you in turn.

Figure 1 shows a schematic of the input procedure. It shows that three types of data are taken off the original source map. First, a scribed map which contains the boundary information. Secondly, a numbered overlay, which in the broad sense shows the location of each of the areas of the map; and thirdly, the classification data which indicates the actual classifications of the areas depicted on the map. These three map derivatives pass through respectively a drum scanner, an x-y digitizer and an encoder and are later combined on magnetic tape in the computer to form the input to the map reduction system. Maps to be placed in the data bank are first scribed onto a clean sheet of scribe-coat with only the lines on the map being so transferred. This is done so that the map scanner will pick up those lines only and not any other information off the map.

Figure 2 shows a section of a scribed present land use map. After having been scribed the map is mounted on the drum scanner which was developed by IBM to meet the needs of the Canada Geographic Information System. The scanner consists of a drum on which a map can be mounted, the associated controls and a moveable carriage which slowly moves the scanning head across the back of the revolving drum. The scan head detects the intensity level of light reflected from the map every 1/250 of an inch and records this information as a series of bits which consist of ones and zeros written on magnetic tape. If the head "sees" a line then

a one bit will be recorded on tape otherwise a zero bit is recorded. The net result of the scanning operation then, is a magnetic tape on which, for every 1/250 of an inch square on the map surface, it is known whether a boundary line was present in that small square or not. A normal full size map sheet takes approximately 10 minutes to scan in this manner.

After the map has been scribed but before it is actually read on the scanner a numbered overlay is prepared. Each area on the map is given a unique but sequential number and this number is written on a transparent overlay. At the same time the corresponding classification or description for each area is transcribed to a data sheet. The scribed boundary map with the transparent numbered overlay is then placed on a d-Mac cartographic x-y digitizer where the four reference corner points of the map and the co-ordinates of one point per map area are digitized. This point can be any point within the map area or "face". We use the word face within the system rather than area so that the word area will be unambiguous, meaning only the measurement, for example, acres. The output from the digitizer consists of a reel of tape on which are first the four corner points of the map, then, for each face within the map, the unique identifying number for that face and the co-ordinates of a point within the face.

The classification data sheet which was prepared at the same time as the numbered overlay is then transcribed onto magnetic tape via an NCR encoder.

We have now captured on tape all the data from the source map and are ready to enter the second part of our procedure—that is, the data reduction system.

The map reduction or data reduction system performs the following functions: it converts the input data into a manageable form; detects cartographic errors; calculates areas and adds maps to the data bank. These functions are performed by nine major programs or phases with some interspersed sort programs and print programs. These nine phases are called, with a great deal of imagination, Phases 0 through 8.

I want to go through each of these very briefly to give you some idea of the complexity of the research that has to be gone into for each system.

Phase 0 is an edit program which ensures that the digitizer and encoder data are valid.

For example, it checks that the four reference points from the digitizer are possible for the given latitudes and longitudes of the map corners and it also checks that a digitizer point and classification data have been given for each face of the map.

Phase 1 is the most complex program of the system. The input to Phase 1 consists of the scanner tape and the output is a segment tape which contains each segment of the input map described in x-y co-ordinates. In addition, Phase 1 has assigned an arbitrary number to each face of the map, this number being known as the "colour" of the face and each segment is identified by the colours of the faces on both sides of it. Later these colours will be matched with the also arbitrary face number assigned it during the input preparation phase and hence the correct classification will be able to be assigned to each face of the map.

The output from the scanner is a "map image" made up of a series of zero bits or one bits on tape. The number of bits per map is very large. For example a 30 inch by 30 inch map would be comprised of approximately 56,250,000 bits. Since this amount of information is much more than can be held in the computer at one time, Phase 1 begins by dividing the map into much smaller sections. One of the major problems encountered and dealt with by Phase 1 is the handling of information which lies right on the border between two sections and the correct processing of such information from one section to another.

To give some idea of the methods used by Phase 1 I would like to briefly describe two of the functions performed by Phase 1—cloud elimination and line following. Figure 3 shows a very small portion of a map highly magnified. The lines on the map are actually only eight thousandths of an inch in width. When scanned each scanner square which falls on the line will be output as a one bit and each one which does not fall on line will be output as a zero bit. Phase 1, when it is about to process this part of the map, will read the scanner tape and will spread the map out in core so that in the core of the computer we do have a true map image which will look somewhat like figure 4 except that I have not written in the zeros for the zero bits. As you can see instead of being a single point wide the lines are made up of clouds of points.

This is so because the scanner spot size is four-thousandths of an inch, half the normal line thickness.

The reduction of these lines to lines of single point width is what is meant by cloud elimination. The first calculation performed is one of very simple arithmetic. Visualize, if you will, a sheet of graph paper. If you think of it as being made up of a number of small squares, this is analogous to the output from the drum scanner where, for each small square we have a certain value, i.e. either zero or one. If, instead of thinking of it as made up as small squares you think of it as a series of lines which intersect at points, then you will see that each point is surrounded by four squares. We begin by calculating a value, called the V-value, for every imaginary intersection in the map image. This value is the sum of a number of bits in the four surrounding squares and thus may range in value from zero through four. Figure 5 shows the result of having done this to our small map. You will notice that the higher the V-value the nearer to the centre of the line the point lies and the smaller the V-value the further away it lies and therefore if we choose only points with high V-values we first of all choose points near the centre of the line and secondly eliminate the other points. We start this process by selecting a suitably high V-valued point. Having selected this point we then follow a path of high V-value doing two things:

1. "Marking" our V-value image to indicate that we have already processed this path; and
2. creating a new map image elsewhere in core with only the selected points.

Figure 6 shows this first path selected through our map by this process. You will notice that the value of the point has now changed. It now ranges from 0 through 7. These values are really direction codes which indicate the direction of the next point along the path. You will also notice that no attempt was made to find that we had gone through an intersection. In fact, the line is traced until one of three things happen; either

- (a) we reach the edge of the section
- (b) we reach a line which has been previously traced or
- (c) we reach an end of a line which does not go anywhere, i.e. if it is an area map, it is an error.

Having, in our example, reached the edge of the section we go back to the V-value table and find another suitable starting value to trace the second path. Figure 7 shows the

boundary trace map image after all the paths in the hypothetical map have been traced. You can see that we did find the intersection because when one of our paths was traced it met a line which had been previously traced. Having successfully eliminated the clouds of points it is now time to do the line following. This is accomplished by going from intersection to intersection following along the boundary trace map image using the direction codes which have already been placed there. As each line is followed the x-y co-ordinate of each point in the line is output into a segment table. Also at this time the map is coloured, that is, the unique number is assigned to every face of the map. As this is being done several points which lie on the map border can be determined and these are used to give a first approximation to the location of the corners of the map. If the colouring process uncovers the fact that a small gap or gaps exist in the lines these would now be corrected and the map, or that section of the map anyway, recoloured.

To recap, Phase 1 performs the following functions:

- (a) cloud elimination
- (b) line following
- (c) colouring
- (d) the closing of small gaps in the lines
- (e) finding the approximate location of the corner points of the map.

Having been given the approximate corner points of the map by Phase 1, Phase 2 then determines their actual locations. The location of these corner points will be used by Phase 3 as we shall see shortly. In addition, Phase 2 performs transformations on the digitizer co-ordinates. The co-ordinate system used by the digitizer is Cartesian and its origin is in effect arbitrary. The transformation performed by Phase 2 is to change those arbitrary Cartesian co-ordinates into a co-ordinate system comprised of latitude and longitude, which we call the Geodetic Co-ordinate System, or GCS.

Using the corner points found by Phase 2, Phase 3 performs a similar transformation to transform the map image into GCS. Both the Phase 2 and Phase 3 transformations also include a colinear transformation to eliminate such things as paper distortion and to correct for the fact that the scanner, unlike the digitizer, does not produce a true Cartesian co-ordinate system because the scan head in fact traces a helix over the surface of the drum.

As a result of these transformations also, both the map image data and the digitizer data are in the same co-ordinate system, therefore allowing Phase 3 to perform the second of its tasks which is to apply the classification data to the correct faces on the map. Phase 3 performs another very important function. A simple calculation reveals that an average density map will occupy approximately 200,000 bytes of storage just for the boundary data alone, if the boundary data was stored in the simple x-y co-ordinate system output from Phase 1. A compact notation for segment storage has been devised which can effectively cut this number down by at least an order of magnitude, and hopefully much more. This compact notation is a code based on direction changes between co-ordinates and the distance between co-ordinates, using a sequence of two bit codes to describe these changes in direction and distance. Finally, Phase 3 applies a "frame grid" to the map. For convenience, our geodetic co-ordinate system which spans the whole of Canada, figure 8, is divided into a number of processable regions called frames. We could not hope to process the whole of Canada at one time. We would have to divide it somehow into processable areas. Each frame is a "square" in the geodetic co-ordinate system. That is, it has the same number of degrees or seconds in the north-south and east-west directions. The smallest frame, called the unit frame, is a square of just under 14.4 seconds to the side. The sequence in which these frames are stored in the system is of some interest. It is very hard to devise a method of storing two-dimensional arrays which is what a map is in a one-dimensional medium. Starting at the origin of the co-ordinate system, which is out in the Pacific, the first four unit frames are in sequence as shown in figure 9. These four unit frames are equivalent to one larger frame—with f-factor 1. The first 16 unit frames are formed by subdividing the first four f-factor 1 frames each in the same manner as the first one was subdivided. In addition, the sequence of the first four f-factor 1 frames is such that it follows the same pattern as the first four unit frames. This building block concept is repeated until the whole co-ordinate system is filled. As shown by this slide each one of these frames is 14.4 seconds on each side. Figure 10 shows the first 256 unit frames which are equivalent to the first f-factor 8 frame. The reason that there are several frame sizes is to allow flexibility in choosing the best one for a given application.

Currently in the Canada Land Inventory System the frame factor used is 5. This frame is 7½ seconds on each side. Figure 11 shows a f-factor 5 frame and how it could be subdivided into frames of smaller sizes.

Up until this stage the system has been dealing with disconnected segments. Phase 4 main task is to pull all these segments together so that once again they form faces, to calculate the areas of these faces and the location of their centroids and to output this data in a more cohesive and final form. While doing this Phase 4 performs two other functions. It discards small faces or lines which were picked up by the scanner from dirt or other marks on the surface of the map and also outputs a list of any errors which it finds. These errors can be of a cartographic variety, that is, there have been lines missed or gaps left in the lines, or they may have been errors caused in the digitizing and encoding process. For example, leaving a face unclassified completely or giving one face two different classifications will cause an error. This error list is used to correct the errors and these corrections are recycled through Phase 4 thus producing valid output. At the completion of Phase 4 we effectively have a data bank. Its main drawback is that we have still kept the map concept. In other words, data could only be retrieved on a map by map basis. Therefore, although the major work of the data reduction system has been accomplished one major task remains. This is the function of Phases 5 to 8, which put the data into the data bank, examining the borders of adjacent maps to remove map border lines which separate the same area on two or more maps. When this has been done the actual master files for each of the coverages is updated.

In order to reiterate what map reduction does, because this is really most of the research that has had to be done, map reduction eliminates clouds from the lines. It follows the lines and it removes distortions caused by paper or by the helix of the scanner. It transforms all the co-ordinates into the GCS system and it colours the faces. It detects any cartographic errors and calculates the areas and then puts the map into the data bank.

A coverage is defined to be all the data of the same type over a given region. Current coverages are present land use, soil capability for agriculture and forestry, land suitability

or recreation, wildlife, administrative and political. As we shall see later these coverages can be combined to form a more complex coverage or can be subdivided to form coverages of smaller regions. Each coverage in the data bank is comprised of two sets of data, which can be stored on magnetic tape, or disk. The image data set, or IDS contains the compact notation of all the boundaries in the given coverage. In our provinces these are basic coverages. Each face in the coverage is uniquely identified within the IDS, each record in the IDS being one frame.

The descriptive data set, or DDS, carries the descriptive information for each face within a coverage. This descriptive information contains the classification data associated with each face, and also the area and centroid of each face. Each face in the DDS is identified by the same number as was applied to that face in the IDS, and with each face in the DDS is also a list of the IDS frames in which the face appears. This allows us to match descriptive information with boundary data, and, of course, vice versa. It is worthy of note that the DDS can be used to answer most inquiries and can, in fact, be processed on a much smaller computer than the associated IDS.

One of the most basic requirements of any map processing system is the ability to compare two maps of the same region—comparing, for example, the present land use of a region with its capabilities. This is done in the system by making a composite map of the region from two or more existing coverages. This function we call overlay. As an example of how much more complex the result of an overlay is than either of the two original coverages figures 12 and 13 on this slide show hypothetical soil class maps and present land use maps. The next slide shows the result of the overlay of these two maps. The result of an overlay is a new coverage comprised once again of an IDS and a DDS which can be acted upon by the system in exactly the same way as an original coverage including, of course, the ability to use the new coverage as an input to another overlay operation. A very much simplified schematic of the overlay operation is shown in figure 15 where a forestry coverage and a present land use coverage are combined to form a composite DDS and IDS. The schematic also shows that the composite DDS can then be assessed by what is termed an assessment program to produce desired results.

The assessment program is the means by which data is retrieved from the system. To make this retrieval of information easier than otherwise might be the case the system has been structured in such a way as to make the format of the data within the data bank "transparent" to the user. Standard routines are included in the system to read the data bank and in many instances frequent inquiries will be able to be answered by means of request forms. In other cases small computer programs are of course required. Assessments can be performed either on simple coverage DDS's or composite DDS's.

Before running an assessment it is, of course, necessary to define the area of interest. This can be done in a variety of ways. First, we may overlay the coverage of interest with the administrative boundaries—province, county, lots, etc. or we can overlay it with the census boundaries to give us results by enumeration area or enumeration district. We can also overlay with arbitrary figures—circles or polygons. This type of area definition, for example, will be used to answer an assessment on finding all types of land of a certain class within 50 miles of say Quebec City. Also areas can be defined by drawing a map of that area and using that map as an overlay to the original coverage.

Finally, although the output from the system will normally be a report, plotted output can also be provided. Development work is currently underway to make this plotted output as meaningful as possible.

I trust that I have been able to give you some idea of how the Canada Geographic Information System works, and also some idea of the magnitude of the task of converting one field of human endeavor to computer endeavor.

Thank you.

The Chairman: Mr. Saumier will add a word or two and then we will go into the discussion period.

Mr. Saumier: Mr. Chairman and gentlemen, we have tried to show you the complete system which starts with an administrative mechanism of a very complex nature involving federal, provincial and inter-departmental co-operation in retrieving data about land use and on the other side a computer based system to analyse this data, compare it and make it available to the decision makers who ask a number of very complex questions from

the assembled data. The whole CLI geographic information system package is a unique accomplishment of Canadian research and technology. It is something essential to administrative decision making and it can also be applied to any kind of situation of the same type whether in Canada or elsewhere. We thought this particular research would be of interest to you and to your colleagues. That is why we have taken some time to explain it to you and we thank you for bearing with us these matters.

The Chairman: Senator Grosart.

Senator Grosart: Mr. Chairman, I'm sure we are all very much impressed with this presentation of the Canadian Geographic Information Service and with the fact that it is a unique contribution of Canada in this field. I am not sure that all of us could write an examination on it at the moment. There are many, many technicalities involved but for myself I can say that I am very much impressed with this achievement.

Now I wonder if I might ask first of all if I am correct in assuming from the brief that total cost to date has been 13.8 million dollars. It is not clear in the brief whether the section headed "budget" refers only to research or to the total land inventory program.

Mr. Saumier: The total budget for the land inventory program as approved some years ago is about 13 million dollars.

Mr. McCormack: Up to March 14th of this year that figure is correct.

Senator Grosart: That is for the entire program and not merely for research components?

Mr. McCormack: We only assumed the cost of the geographic information system up to April 1, 1968, so that the 1968-69 costs of that system are not in there, but all the rest is.

Senator Grosart: Could you estimate the cost of the ancillary amounts expended by the provinces?

Mr. McCormack: It would only be an estimate, but the provincial contributions by way of staff salaries and equipment would be something in the order of one-third to one-half of that amount in addition.

Senator Grosart: This 18 million was approved when?

Mr. McCormack: In 1964.

Senator Grosart: Of course there were very small expenditures prior to that.

Mr. McCormack: Virtually none. In fact, be honest with you Treasury Board has approved prior to 1964 an amount of approximately \$3 million, because we realized as they that the first approval was merely preliminary, and this \$18 million was a subsequent submission based on more information.

Senator Grosart: What percentage of the total project is now completed to this finished map stage?

Mr. McCormack: Well, I could give you a rough percentage.

Senator Grosart: For the red line area.

Mr. McCormack: Between 50 and 60 per cent of the area. It is only fair to add that certain sectors are virtually complete. For example present land use is virtually complete and the section dealing with agriculture is about 80% complete. That section dealing with capability for recreational is 75 per cent complete and this includes all provinces in Canada. In total it would be between 50 and 60 per cent complete.

Senator Grosart: What would be a rough estimate of the total cost for the whole region, I think you use the word "face" to bring every "face" to the point of completion of the B.C. map?

Mr. McCormack: If I may elaborate on that, senator, you have moved into another phase. This goes from having the basic data into land use planning. This is macro planning or blocking on a large scale. I would think you could do land use planning in Canada at the macro level for something in the order of about \$500,000 each for the larger provinces and something in the order of \$300,000 each for the smaller provinces which would mean about \$1,000,000 for the Maritime provinces and about \$4,000,000 for the larger provinces.

Senator Grosart: So most of the work is done?

Mr. McCormack: No, we have only been in this land use planning phase, in other words utilizing the data for actual planning, for a little over a year. In fact, a large part of this work has been done as a basis for the FRED program in Prince Edward Island. Macro planning is being done in Nova Scotia. Some

micro planning—and this is why I like to keep a distinction here—is being done in the Musquodoboit area of Nova Scotia as well.

We have a project before the Treasury Board for \$300,000, to undertake a macro plan in New Brunswick.

It has been started in Quebec and Manitoba, and it is well under way in British Columbia. Otherwise, the other provinces have not as yet taken it on.

Senator Carter: Have you done any in Newfoundland?

Mr. McCormack: No. Are you from Newfoundland, senator? Would you like to know the setup in Newfoundland? It is a little bit different. We originally undertook the inventory, in the Province of Newfoundland, under the Canada Land Inventory. In late 1965 in fulfillment of one of the articles of Confederation in which the Government of Canada agreed to update their resource data to a level of the rest of the provinces, a special agreement was signed to undertake the capability studies, plus a forest inventory on both the island and Labrador. This is an eight-year program, which began in 1966, so we do not expect to complete Newfoundland and Labrador, even under this arrangement, until 1974.

Senator Grosari: If I may move from that—not that I do not regard it as very important, because obviously this is a tool of the whole of the operational activities of the new department...but there are some other questions that come out of the brief. The first comment I would make, Mr. Chairman, is that we do not have here a clear concept of the total research effort of the department as it existed formerly. I know this is difficult. I have tried to trace it through the briefs of the various component instrumentalities, but without any great success. I wonder if we could have, in due course, a tabular statement of the total research activities—by people, and by dollars?

The Chairman: This would have only a kind of historical interest, as you understand.

Senator Grosari: I was just going to comment on that, Mr. Chairman. The reason I have been interested in it is that the minister, in discussing the new department, has made it very clear, as I read his statement, that the research establishment will be a very important part of the new department. I would like in due course to compare the two. I recognize that we are, as somebody said, dealing with

an obituary situation and I also remember that there is an old maxim that one should speak only well of the dead.

However, the activities of these various components have been very very seriously criticized in the past, largely on the grounds of lack of pre-research. I am not going into details. The minister himself has admitted that one of the reasons for the new department is to get a much higher degree of co-ordination interdepartmentally and project by project.

Very serious criticism was made recently of the whole operation in the *Monetary Times*. I will read only the first paragraph:

The federal Government has finally gotten around to admitting what the critics, the opposition parties, and the provincial premiers have known all along: the regional development program is a mess.

I am inclined to think that is an exaggeration, but the stress everywhere is on the fact that there was inadequate preplanning research.

I would like to know—and I ask not in any critical way—if this has been taken into account and is a major factor in the setting up of the new department.

Mr. Saumier: The answer to that is quite clearly yes. There will be in the new department a large research group or planning group, which will be headed by an assistant deputy minister, whose name will be announced very shortly. This will be a group, large in size and, we hope, high in competence, which presumably will go quite a long way towards satisfying the preplanning research which you have in mind.

The Chairman: What would be the composition of that section?

Mr. Saumier: A deputy minister—Planning; a director of economic analysis; a director of social and human analysis; and a director of plan formulation.

In other words, the whole concept of the new department—if I may say so, in parenthesis—is not to make research or prepare plans or implement plans, but to cause action to be taken.

So we visualize the department as a process where we start with a large broad range of analysis on the economic or social side and then move into a broad plan formulation stage; then we flush out these broad

plans into the negotiating stage and then implement the plans, in co-operation with whatever federal and provincial agencies are involved in these.

So, on the research side, we will have, we hope, the staff and the structure which will enable us to say to them that the plans we prepare are backed up by some analysis of the situation to be corrected.

Senator Grosart: May I ask if you will, within the department, develop a national resource use plan?

Mr. Saumier: Whether we will develop a national resource use plan is a question which at this time is a little difficult to answer. If one reads our department legislation carefully, it shows that the main thrust of the department should be in what the legislation calls "special areas" which suffer from particular problems. So we will be judged, I would think, by the impact of our efforts in these special areas.

It may be that, in order to have more meaningful action in special areas, somebody somewhere will have to develop a national resource use plan or a national plan in some other sectors of some kind.

Whether this development will be done by our department or by some other agency, or conglomeration of agencies, is a point which remains to be seen in the future.

As you know, the Economic Council, as I recall, is entrusted with the preparation of certain broad economic perspectives. When these perspectives are being developed—and they are being developed—we will of course be in a position to use them, and so forth.

Senator Grosart: A vital question, which has come out of the attempt to do something about regional development in the past, has been that you may have been picking the wrong areas. I do not see how you can assure yourselves that your choice of development areas is valid, unless you have a master plan, such as was recommended, as you well know, in the Resources for Tomorrow Conference.

The Conference affirmed the following needs: to complete a countrywide assessment of resources supplies which may be set against long term assessment of resource needs.

It has been pointed out, for example, in ARDA, and I think also in FRED, the main beneficiaries in terms of total funds have

been Ontario and Quebec, and not the so-called have-not provinces. Would you care to comment on that?

Mr. Saumier: The comment I can make is that, first of all, take FRED, if I may. We have, as you know, a very large FRED plan for the Island of Prince Edward. We have a very large FRED plan for the Gaspé area and a very large one also in the northeastern area of New Brunswick and one flood plan in Manitoba for the interlakes so the large inputs of FRED have been by and large in what we might call eastern Canada, east of Three Rivers.

Senator Grosart: A famous phrase.

Mr. Saumier: That is right. From that point of view I think it can be fairly said we have devoted our attention under FRED to eastern Canada. Under ARDA you will appreciate Mr. Chairman, that the formula or I should say maybe the amounts of money which are placed at the disposition of each province under ARDA—what we call the provincial allotments under ARDA—is determined by a formula which takes into account the population, income and so forth in the rural areas. Therefore obviously, as you have a larger rural population, you are bound to have larger amounts of money. As you have a smaller rural population you are bound to have smaller amounts of money so in some way the fact that the rural population, for example, let us say Prince Edward Island, is much smaller than the rural population of the Province of Quebec as reflected in the fact that the ARDA allotment for PEI is considerably less than the ARDA allotment for Quebec.

Senator Grosart: Do you see any validity in the criticism made by the Economic Council that it would not be difficult to pick out a good many projects where the actual result was to spend a dollar of federal money to give a farmer 50 cents.

Mr. Saumier: Mr. Chairman, I suppose the senator is referring to the Buckley Tihanyi Report which I have to point out is not a report of the Economic Council. It was paid for by the Economic Council, but as all these reports point out, the opinions of the writers are not necessarily those of the council.

Senator Grosart: I might say I do not fully accept that. We have the same thing with the Science Council. My view is that any such council publishing such a report should repudiate any parts of it with which it does

not agree. I think this is sort of an escape clause that is being used by the Economic Council and by the Science Council to put out information which is useless unless it is assessed by the issuing authority that pays for it. The Economic Council did issue this report. That is an aside, but it is my own view on this. I hope this Science Policy Committee will not be guilty of that.

Mr. Saumier: Mr. Chairman, when it comes to assessing the value of the Buckley Tihanyi Report one has to keep in mind that it was based by and large by studies and evidence up to about 1966. The essential comment that the Buckley Tihanyi Report makes is that they thought, in the opinion of the two principal researchers, that too much emphasis had been given to resource development *per se* and too little emphasis had been given to what one might call human development. This is a conclusion to which we have come, ourselves, within the ARDA administration and this is why for example in 1965 the name of the legislation was changed to Agricultural and Rural Development Act. Along with this name and this change in name we try to bring about a changing focus or away from resource development and in the narrow sense of the term into what we might call human development in the broader sense of the term.

The Chairman: Previous to that you were limited by the legislation.

Mr. Saumier: Yes, to resource development projects. The main conclusion we came to was that by and large problems of rural poverty would not be resolved by resource development projects and that having a resource development project in no way made sure that the underprivileged rural population would at all benefit from this project. This is why this has led us to change our emphasis from programs trying to develop resources only to programs, first of all, which try to develop resources and people. More and more this is a clear case. For instance in the FRED program, there is a combination of the ARDA program which puts maximum emphasis of problems of human adjustment within the area or outside of it.

Senator Grosart: As reflected in the new name of the department—Regional Economic Expansion—the emphasis I presume is on economics.

Mr. Saumier: If you look at it you will see there is a double mandate. It is reflected in

the legislation, itself. It says economic expansion and social adjustment.

Senator Grosart: Finally, Mr. Chairman—I know other senators will have questions, I have mentioned these criticisms in the past, but as I say, not to defame the dead, but to hope or to suggest that there will be a very well researched master plan now within the department. To me this is the most important aspect of the very great powers that have been given to the minister in the department, to which personally I do not object. I think a minister needs these kinds of powers if he is going to get the results that are expected from the Department. I leave that suggestion with you.

The Chairman: Senator Robichaud.

Senator Robichaud: Thank you, Mr. Chairman. The question will be brief as I have to leave for an engagement. May I first say that I am in complete agreement with a statement we heard in the first film when it said that to make decisions we need facts. We know it is a fact that governments need all data available before making decisions. Notwithstanding all the information available quite often and sometimes rightly so the decisions taken by government are subjected to questioning by many. My first question would be what is being done? We were shown how these data are accumulated, but what is being done to keep such data up to date for the various maps that are being computed, because it could be that as land use or population changes in certain areas that information already computed becomes obsolete and could lead to wrong decisions. What is being done to keep those maps of these data up to date?

Mr. Saumier: Mr. Chairman, I think it is fair to say that we have not yet come to crossing that bridge. What we are engaged in now is the process of assembling the data. The question you raise is one which is most legitimate, because obviously we are not interested in building up a historic archive of data. We want data which can be kept constantly up to date. How this will be done is a question which we will have to address ourselves and I would think this would be within about a year or so when the present effort will have come to its conclusion.

Senator Robichaud: My second question, Mr. Chairman, would be directed to the present operation of ARDA or particularly of the FRED fund or rural economic development. We all recognize that for years surveys have

been made in certain areas. I am referring particularly to the Atlantic provinces. Studies have been made as well as economic surveys. In 1966 I believe the Atlantic Provinces Research Board requested a certain firm to make a survey of the economic research relating to the Atlantic region and the chief purposes of this study which, as I have said, was commissioned by the Atlantic Development Board and was to review on a selective basis an economic research relating to the Atlantic provinces. I know in this report that 107 of such research studies were made and some were classified and distinguished. This was the kind of study that was made under FRED.

We know that the federal government signed an agreement with the province of New Brunswick for a program under the Fund for Rural Economic Development in the fall of 1966. Since then, judging from the publicity which has been given to this program, every time we open a New Brunswick newspaper particularly referring to the north shore where this program is being applied we see that groups have met, that they had committees making studies but we are still waiting for the implementation of the program which has been under way now for almost three years. As far as I can see referring to north-eastern New Brunswick, and I apologize for being regional in my remarks, there are two projects, a road project and a marine project which have been under discussion for many many years. I have been in politics for 15 years and I know that these matters have been coming up for discussion before every election. One of them deals with a road joining Gloucester and Restigouche. What is FRED doing in that area and what is being done to implement the programs which I understand involve some \$90 million.

Mr. Saumier: This is a very, very far-reaching question and I will try to be as brief as I can in answering it. The basic assumption upon which the FRED program for north-eastern New Brunswick was built, and we must recall this here, is that the area is characterised by severe under-employment and unemployment so the basic assumption was that a certain number of jobs should be produced in the area specifically by the Bathurst-Belledune complex. Therefore certain mechanisms were contemplated to make sur that the jobs becoming available would be filled by the people of the area as opposed to being filled by people from outside the area which is a

traditional pattern in under-privileged areas. In another field what has happened has been that the quantity of jobs created in that complex has not reached the proportions that had been foreseen in the project which has been made by the planners and researchers at the time the agreement was being prepared. So that in consequence the whole effort of the plan has had to be correspondingly slowed down because there is no purpose in moving people from situations of rural poverty into situations of urban poverty. As a matter of fact, and some of your colleagues may know this, we are now in the process of reviewing and revising the agreement concerning north-eastern New Brunswick. A few days ago I was looking at the first report of the consultants who are helping us in this assessment and who are looking at the prospects for the future of this Bathurst-Belledune mineral complex and they came to the same conclusion we came to four years ago that the prospects are excellent for considerable expansion but the timing of the expansion is very uncertain. This is one of the root problems we have to face whenever we put together a plan of this kind. It is not within the power of the government to cause an expansion of this complex because it depends on international situations and international markets. When international markets face an increasing demand situation these industries will expand. If for a number of reasons developments proceed at a slower pace and if you are left without the wherewithall to provide the opportunities for people, which is one of the main points of the new legislation, then we have to find something which transcends this complication by helping us develop in a broader area. Taking the case of north-eastern New Brunswick the plan now encompasses a rather small boundary. There are developments going on outside the boundary but because we were limited by the legislation which provided the fund for rural economic development we were not in a position to take action and move the people from the area narrowly defined to areas outside it where certain development opportunities were in existence or could have been stimulated. This is one of the things which the new legislation will enable us to overcome.

Senator Robichaud: I would say a large percentage of the funds spent so far of the taxpayer's money has been spent for the maintenance and operation of these studies and committees and this sort of thing. What can be done to control such expenditures?

Mr. Saumier: In the case of north-east New Brunswick most of the funds spent under the plan has been in connection with education. There has been a massive school construction program in the area. Federally most of the funds have been spent under the manpower programs. In fact there has been very little spent on research under the program. The only major research program we have had and which will cost about \$100,000 is the research going on now designed to evaluate the impact of the plan so far and which will provide guide-lines for a better agreement which should be forthcoming within the next few months.

Senator Robichaud: Has any effort been made to avoid duplication of effort with the Atlantic Development Board in making surveys? I am referring to a project for the southern part of the province which is concerned with the construction of a large fishery port. At one time I believe there were three different surveys under way by three different agencies for the same purpose. What is being done to avoid this type of duplication?

Mr. Saumier: One of the prime purposes of this new department is to try to avoid this type of duplication. For that reason the Atlantic Development Board is part of the new Department of Regional Economic Expansion and this should help somehow to reduce what you refer to as duplication of research. One must however keep in mind that a large number of research projects are initiated by the province and it is not within the power of the federal government to prevent provinces from launching such projects which are of interest to them.

Senator Robichaud: Is this with federal participation or without federal participation?

Mr. Saumier: Where there is federal participation such things are easier to control, but where there is none we have no way of preventing duplication.

Senator Bourget: What kind of liaison do you have between federal agencies and the provinces? Is there an advisory committee to work with the different agencies or somebody who decides what kind of projects should be implemented?

Mr. Saumier: Are you referring to activities under the new department or activities of the government at large?

Senator Bourget: Well, since you work with the provinces we would like to know if there is a co-ordinating committee to look into the kind of projects to be implemented.

Mr. Saumier: The ultimate and I might say the main purpose of the new department is to provide the federal government with a unified voice when it comes to regional development programs. It is our hope to foster within the provinces the emergence of a program which has the same effect for the provinces. But I think one has to face the fact that in any kind of complex operation, such as the federal or the provincial government, no one department can rightfully claim to play an overall co-ordinating role. Each one is set up by its own authority and each one has its own mandate. What we can best hope to achieve is at least to be informed of what is going on and then possibly to cause the Government to take steps which will reduce the degree of duplication which may arise otherwise.

Senator Bourget: So that the federal agencies have representatives with the provincial committees?

Mr. Saumier: This is a question which is difficult to answer in the abstract, because each situation has to be dealt with in its own way. The way we work is that in the case of a complex problem, to set up these committees, federal-provincial in nature, and in which a number of federal and provincial departments are represented. This is a way of trying to make sure that we are aware of all the efforts undertaken by both the federal and provincial governments involved.

Senator Bourget: How much of your research is done by universities or by private organizations, and how much of the research also is done in the house?

Mr. Saumier: If this question, Mr. Chairman, relates to the new department, I do not think it is possible to give an answer to it, because the new department has not been established for more than a few weeks and so we have had hardly any research within the department as such.

If you refer to the agencies which have been brought into the department, this question has to be answered on an agency by agency basis and we have tried to provide in the material submitted to you some indication as to the relevant breakdowns. I would hesitate to make a guess as to exactly these proportions, and I would think that in the

material we will submit in answer to Senator Grosart's questions, some of these queries will in fact be answered.

Senator Grosart: At the end of Table 3 in your report, it is mentioned that the branch responsible for ARDA and FRED has no research personnel. Who would be doing the research then? Would it be an outside private organization?

Mr. Saumier: By and large, under ARDA—and again I have to stress that the ARDA organization as such has been absorbed within the department as a whole—under ARDA, a very large part of our research was done by the provinces themselves, or by consultants hired by the provinces, in which case, in either case, we are paying a varying share of the cost. In ARDA, we have basically two research mandates, one under the ARDA regulation itself and which enabled us federally to do some research, although it was relatively a small amount. Then, under the ARDA agreement, which enabled us to finance in part the cost of research undertaken by the provinces. Most of our research effort has been of the second kind. In fact, the large majority has been of the kind where we made a contribution to provinces to enable them to undertake certain pieces of research which appeared both to the province and to us as being worthwhile and interesting.

Exactly how this research is conducted in individual cases—at some points, for example, the CLI itself, which a major piece of research, it has been done in house. In the case of the Geographic Information System, it has been done mostly through consultants. This varies from case to case. It is very difficult to arrive at a generalization as to whether it is done mostly in house, or mostly in federal, or mostly in provincial, or mostly in consultants, and whether they are federal or provincial consultants.

Senator Bourget: But in all cases, whenever the province puts forward a project of research and when the federal Government shares in the cost, it has to be approved?

Mr. Saumier: Indeed, yes.

Senator Bourget: I read in Tables 2 and 3 that the research expenditure on FRED planning, before the ARDA program, was one of the most important projects has been Gaspé-Quebec. I suppose that has to with BAEQ.

Mr. Saumier: That is correct.

Senator Bourget: Could you tell us briefly what kind of projects so far have been incorporated in that particular project?

Mr. Saumier: The BAEQ project?

The Chairman: For those who do not know that project, I might add that it covers not only the Gaspé but the Lower St. Lawrence.

Senator Grosart: And the National Park.

Mr. Saumier: The BAEQ project—that is that of the Eastern Quebec Development Bureau—was essentially a private non-profit corporation set up provincially or by a number of associations active in the area, to engage in the process of research leading to the preparation of development plans for the Gaspé. The total cost of the studies done by the BAEQ—the complete report of which covers about ten volumes—was roughly \$4 million, of which \$2 million...

Senator Grosart: Excuse me, how does that \$4 million figure compare with the \$1.3 million given for research expenditure on Table 2?

Senator Bourget: Table 3 also mentions \$1.6 million, from 1965 to 1968.

The Chairman: This was started in 1963.

Mr. Saumier: This was the first phase. If you look at the answer on Table 3, you will see there \$1.7 million as well.

Senator Grosart: That adds up to a little more than \$3 million.

Mr. Saumier: About half of this money was spent on research projects as such, located at various sectors, trying to assess their potential, and so forth. Roughly another half was spent on what is called the social animation process, trying to make people of the Gaspé and Lower St. Lawrence aware of the problem and involved them in an analysis of their own situation, so that they would be sensitized to the need for change in the area. The outcome of the research of the BAEQ, as I said, was a very large and significant report, which served as a background material, basic material, for the preparation of the Gaspé-FRED agreement, which was signed about a year ago between the federal and provincial Government.

This Gaspé-FRED agreement is now in the process of being implemented. Of course, as to be expected, there is some difficulty, but on the whole, this whole agreement is working fairly well.

Senator Bourget: There has not been any practical results so far, as far as BAEQ is concerned?

Mr. Saumier: The practical result has been the signing of the agreement and then the implementation of the agreement. Last year, under the agreement we spent, as I recall, some \$5 or \$6 million and this year we are going to spend about twice that much, or a little more.

Senator Bourget: Is that for studies again?

Mr. Saumier: No, this is for actual projects.

The Chairman: The signing of the agreement was about a year ago—the object of the agreement was the plan.

Senator Robichaud: What specific projects have you undertaken on the Gaspé coast—there was \$5 million last year and \$10 million this year.

Mr. Saumier: There is, for example, what is called the accelerated manpower program. There is certain tourist development which will hopefully take place in a number of centres. There is a consolidation program whereby a number of farms are in process of being bought and consolidated. There is a marginal parishes program, whereby some marginal parishes or marginal settlements will be closed down and the people moved elsewhere. There is a whole raft of projects. If the members of the committee are interested in securing more information, we can provide it for them on this topic.

Senator Grosart: Is the Newfoundland relocation program regarded as successful?

Mr. Saumier: This program is one which is...

Senator Grosart: A provincial program.

Mr. Saumier: The main input federally has been through the Department of Fisheries and I must confess I would be hesitant to speak here for the Department of Fisheries. But my impression is, from conversations with Fisheries officials, that while they are the first ones to admit that this kind of program inevitably runs into sizeable difficulties, nevertheless we feel that for its duration it has been quite successful.

Senator Robichaud: May I ask what is preventing the Department of Regional Developments from taking over this program? I understand that, when first undertaken a few

years ago, one of the main reasons why it was done by Fisheries was because the Fisheries Department had...

The Chairman: It was ARDA.

Senator Robichaud: They were prepared to implement it and they had the organization to do so. But it was understood at the time that within two or three years it would be transferred to ARDA. What is preventing this transfer? I know that funds are being used for resettlement by the Department of Fisheries and they are preventing the department from getting involved in some other project on account of the million and a half or over \$1 million voted every year for the implementation of this resettlement program.

Mr. Saumier: Mr. Chairman, when discussions were held with the Department of Fisheries as to ARDA taking over the department what had been anticipated at the time was that at some point there would be a FRED agreement with Newfoundland and that the fisheries resettlement program would then become part of this FRED agreement. For a number of reasons, which I expanded upon when I was a witness before the House Committee on Regional Development, this FRED agreement with Newfoundland did not come to pass. We are now working again with Newfoundland on the preparation of regional development plans.

Senator Carter: You mean there is no ARDA agreement with Newfoundland? Is that what you are saying?

Mr. Saumier: I am sorry, there is an ARDA agreement with Newfoundland, but not a FRED agreement.

Senator Carter: FRED has disappeared has it not?

Mr. Saumier: Yes, FRED disappeared so now there is no agreement with Newfoundland. We are working very actively towards a regional development plan of some kind for Newfoundland and I would think that when this plan is finalized then the fisheries resettlement program will of course have to be taken into account. If it appears desirable for it to be and if you want it to be closely integrated or absorbed by the plan this will be done. Whether this will come to pass only time will tell.

Senator Grosart: Mr. Chairman, I wonder if I might ask which of these current agencies are to be carried on in the new department?

In the table of contents, we have ARDA and FRED, the CLI and the Regional Information System, ADA, Atlantic Development Board and Prairie Farm Rehabilitation Act which are still alive.

Mr. Saumier: Mr. Chairman, I think I will have to make clear a distinction between what I would call legislative survival and administrative survival.

Senator Grosart: The latter is much more important.

Mr. Saumier: Let me take the two, one after the other. From the legislative point of view the ARDA Act and therefore the ARDA agreement is still in force. The fund or Rural Economic Development Act has been—I do not know the technical way—abolished.

Senator Grosart: It faded out.

Mr. Saumier: It has been repealed by the new legislation. The Canada Land Inventory and the Regional Information System were ongoing programs, not departments acting upon any particular legislation. Those are being carried on. The Area Development Agency, as far as it was set up under certain sections of the Department of Industry Act, has also been abolished and its parent legislation repealed, but another piece of legislation which is the Industrial Incentive Act is still remaining and will be replaced, hopefully, as our minister has indicated, by a new piece of legislation dealing with the problem of industrial incentives. The Newstart Program was an administrative section of the Department of Manpower and Immigration and it has now been absorbed within the department. The Atlantic Development Board Act has been repealed and the Prairie Farm Rehabilitation Act is still in force. From the legislative point of view some of these are still in force and some are not. From what we might call the administrative point of view all of these various groups have been melded into the new department. Of course, there is a continuing ARDA legislation which is administered by the department, but there is no longer, for example, the specific rural development branch within the department. The responsibility for it is now diffused within the whole department. None of these agencies are any more identified as such within the department. There is no ARDA branch or area development branch or Atlantic Development Board branch.

Senator Carter: What will happen to the projects that were continuing under FRED and under ARDA?

Mr. Saumier: These projects are all continuing. The FRED agreements of course are being honoured and will continue to be honoured. The ARDA agreement is still in force. All the projects which have been started are continuing. The effect of the repeal of certain pieces of legislation is to prevent, technically speaking, certain kinds of projects from being implemented under a particular legislation, but the overall departmental legislation has been cut in such a way as to be able to absorb effectively all the activities of the previous diverse agencies. There should be no hiatus at all or no break in the activities of the department.

Senator Carter: The Atlantic Development Board had a fair rating going. Is your department continuing these?

Mr. Saumier: Indeed.

Senator Grosart: Under the ADA or the advisory board?

Mr. Saumier: Well, the Atlantic Development Board which was to some extent decision-making by itself has been abolished and these decision-making powers have been entrusted entirely to the department of the advisory capacity and have been taken over by the Atlantic Development Council.

Senator Grosart: What area development instrumentalities, particularly in the industrial incentive field, are left now with the Department of Industry, Trade and Commerce?

Mr. Saumier: I would think, Mr. Chairman, although I would not be able to say with complete assurance, that as far as I know the Department of Industry, Trade and Commerce has no longer the authority to make grants to industries.

The Chairman: Not in designated areas. They are certainly making grants for other purposes.

Mr. Saumier: That is right. The ADA legislation enabled the then Department of Industry to make capital grants to new industries or expanding industries in designated areas. This power is within the Department of Regional Economic Expansion.

The Chairman: The other incentive programs for research technology will be gone

within the new Department of Industry, Trade and Commerce?

Senator Grosart: What about ARDA and PAIT? Surely they still have the power to say that they not only consider the incentive to the particular industry, but also to the particular region. Is that a matter of interdepartmental discussion?

Mr. Saumier: When you say, sir, incentive to a particular region, if you talk about capital grants to industries to establish new plants as far as I know this now is not entirely within the new department and the Department of Industry, Trade and Commerce does not have such grant-making capacities. They have other grant-making capacities for research purposes such as the PAIT programs and others which the Department of Industry was carrying outside the specific mandate of the area development agency which is now wholly transferred to the new department.

Senator Bourget: Would the new legislation have more freedom to designate vast areas?

Mr. Saumier: More freedom, yes.

The Chairman: You are responsible for delegating these areas?

Mr. Saumier: That is right.

The Chairman: This has been taken over from Labour?

Mr. Saumier: From Industry.

Senator Grosart: The old Manpower Department.

The Chairman: But previously I think Industry did not have the power to delineate these regions. This was a responsibility of the Department of Labour.

Mr. Saumier: They had to work very closely with the Department of Labour and then with the Department of Manpower and Immigration because the statistical basis upon which the delineated area was provided by the NES areas and the CMC areas. Under new legislation this likely will no longer be as close. In other words, we will not be limited by the boundaries of the CMC.

The Chairman: Which were very artificial.

Mr. Saumier: In some cases indeed.

Senator Grosart: The power to designate is given to the minister or the Governor in Council.

Mr. Saumier: We have now two powers to designate, one under the departmental legislation whereby we designate special area and the other—

Senator Grosart: You mean the minister?

Mr. Saumier: Let me think. I should know that. This has to be approved by the Governor in Council and also under the present ADA this has to be—

Senator Bourget: Did you say also the Newstart Program has taken over the responsibilities of the Manpower Department regarding the retraining of unskilled labour?

Mr. Saumier: The Newstart Program, sir, was strictly speaking an experimental program and still is. It is a program designed for the purpose of defining and testing in selected experimental areas new methods to train people for productive employment. So the Newstart program is not a program which is applied at large but is essentially an experimental program where we try to define areas where there are populations or people which are suffering from particular handicaps when it comes to retraining them for productive employment.

The purpose is to define new methods that are practical for handicapped persons. This is a laboratory approach.

Senator Bourget: You do not see any problems there?

Mr. Saumier: No.

Senator Bourget: It is limited.

Mr. Saumier: Very limited to very small areas and very specific purposes. It is a research program, essentially. Of course, when it comes to retraining people, you have to test in reality the methods which researchers and specialists may think practicable, but the testing areas are, geographically and population-wise, very small.

Senator Bourget: Did you get some help from the Department of Manpower?

Mr. Saumier: Yes.

Senator Grosart: If I may revert to my earlier question, the witness just said that Newstart is largely a research operation. Strangely enough, it is the one agency mentioned in the brief that does not give us any kind of run-down of its research personnel, which was one of the reasons I asked that question, because, if I may just put this on

record, Mr. Chairman, my count, from the brief only, is that ARDA and FRED have no people on staff, and I am speaking now of a professional research people. We have the statement that research is not the responsibility of any particular unit. I am aware of the fact that there are contractual arrangements and that a great deal of this may be provided by outside professional research. In the land inventory field we have a total of 413, of whom 59 are federal; in the area development field we have four; in Newstart there are 58; the Atlantic Development Board has 16 and PFRA has 31.4.

My question was whether that was the whole picture and whether we could have it broken down.

Mr. Saumier: Yes, sir, I will provide that data for you.

Senator Grosart: The disciplines in which these professional people are skilled would be helpful.

The Chairman: How do you plan to organize this new research operation you are undertaking in relation with other departments? Let us say, for instance, how you will relate this new operation with the research being done in agriculture or in the Department of Fisheries or even in the Department of Manpower and Immigration, because it would seem to me that these are the three other research operations which are very close to your field of interest.

Mr. Saumier: Let me put it this way, sir. I do not believe that it is the primary purpose of the new department to engage in what we might call basic research. The new department is not a research department but is an action department. Therefore, the test we have to apply to any research project that we may get involved in is what is the bearing of this research program on certain problems we have to solve now or in the near future.

Having said that, I must temper that statement by saying we have to be in a position to anticipate problems before they arise, so that we will not always be running from one crisis to another. Obviously, in order to anticipate problems one has to be able to take a fairly broad perspective. In order to provide this broad perspective, there will undoubtedly have to be some sort of continuing basic research on the overall economic trends and so forth, but this will be a fairly small portion of the departmental program. When it comes to what we might call, for lack of a

better word, action research, which is research directed to specific problems, the nature of the problems we are investigating will dictate a kind of co-ordinating mechanism we will establish with other departments. If it is research on a broad area basis, in an area where there is a substantial amount—in fishing and forestry, for example—clearly, when we set up our research program and our action programs, we have to work very closely with the departments who have the competence and expertise we need to bring to bear on these problems.

The first temptation that any new department has to resist most vigorously is to think in some way it can become a repository of all wisdom and of all knowledge. We have to remain rather small, and one of our prime purposes must be to be in a position to tap existing knowledge and expertise wherever these exist. This encompasses, in the first instance, the existing federal departments. This is a statement I think everybody will applaud. How this in fact will be done is one of the most difficult organizational problems which confronts the department, just as it is one that confronts any agency entrusted with a co-ordinating role—how to set this up, and to establish links with other departments, to make sure the accumulated knowledge and expertise available in these departments are effectively used, and to prevent our launching projects to provide information that is already extant and available. This, I daresay, will be a continuing organizational problem, and I personally doubt whether we will ever see the day when this problem will be completely overcome. It is a continuing problem for any large organization, and a particular problem of a new department, and this is one of the main challenges, from the organizational point of view, awaiting us, as to how to organize ourselves to achieve this.

Senator Grosart: When introducing the bill, the minister was fairly optimistic on that and said:

We have had a variety of programs operating independently, with too little co-ordination between them. This approach has obviously not worked. It may have stopped the gaps between regions from widening but it has not narrowed them.

This legislation will, therefore, firmly charge the new department, and myself as its first minister, with the central responsibility for federal regional develop-

ment programs. This is the only way to secure the co-ordination of federal effort which is essential to the achievement of the most effective results.

The Chairman: What we were discussing a moment ago was not implementing regional programs, but really the organization of research, and this is not what the minister was referring to, it seems to me.

Senator Grosart: I thought it was what Mr. Saumier referred to, because he spoke of the difficult problem of co-ordinating the work of other departments.

The Chairman: Co-ordinating research.

Mr. Saumier: The same applies when it comes to co-ordinating action.

The Chairman: Although I do not believe very much in interdepartmental committees, perhaps it might be useful for you, at least in terms of research, to have some kind of interdepartmental committee with these various departments so that you have an occasion once in a while to know what the others are doing, and also to fill in the gaps, because very often in these fields we are doing so little good research that gaps are more probable than is duplication.

Mr. Saumier: I can assure you, Mr. Chairman, that there will be a multitude of interdepartmental committees. I would like at this moment to point out one area of research where we possibly have been most interdepartmentally involved, and this is in respect of the Canada Land Inventory. The whole research effort is really an interdepartmental effort. The staff of AIDA are, as an estimate...

Mr. McCormack: There are only three permanent members of AIDA. The rest are seconded.

Mr. Saumier: Yes. The whole work is co-ordinated by the Canadian Land Inventory.

Senator Carter: You said that the AIDA legislation had been repealed and replaced by other legislation coming under the Department of Industry.

Mr. Saumier: No, sir. This is a very complex matter. The Department of Industry Act provided, if you like, an organizational locus for AIDA. In order to remove it from the Department of Industry and locate it within

the new department, this piece of legislation of the Department of Industry had to be amended. There was also another piece of legislation called the Industrial Incentives Act, which enabled in the past AIDA to make grants, and which now enables the new department to make grants. This Industrial Incentives Act is still intact.

Senator Carter: Under the Department of Industry?

Mr. Saumier: No, under our department. This is why the Department of Industry Act had to be amended. It was to enable the Industrial Incentives Act to come under our department.

Senator Carter: And the other functions of ADIA have been taken over by your department?

Mr. Saumier: Yes.

Senator Bourget: In that particular instance, are you satisfied with the result obtained so far as to the stimulation of investment in depressed areas? Are the policies already applied adequate, or do you propose some changes?

Mr. Saumier: Well, sir, as our minister has indicated, we propose to make fundamental changes in the industrial incentives legislation. Mr. Marchand has indicated that we hope to have the new legislation available by the end of the spring, or the early summer. There will be some fundamental changes in the legislation.

Senator Bourget: I have here a publication by the Area Industrial Development Agency which shows that the number of jobs created per 1,000 of population has been more in provinces like Ontario and Alberta than in other provinces.

Mr. Saumier: That is correct, sir. This is a common problem in respect of legislation of this type. It is always the richest and best organized provinces that are the first to take advantage of it, while those provinces which are poor, and consequently less well organized, experience considerable difficulty in being able to take advantage of the legislation. This process is reinforcing itself. We begin to understand why rich provinces become more rich, and why poor provinces stay poor.

Senator Carter: In all of this land inventory data that you showed us on the map, are you

accumulating geological data of the mineralization of the land as well, or is that being done by some other department?

Mr. Saumier: The C.L.I. itself is not accumulating mineralogical data. However, the geological information system of the Department of Energy, Mines and Resources is capable of handling this data.

Senator Carter: But your department is not interested in the mineralogy?

Mr. Saumier: From the point of view of land use admittedly we are interested. We are more interested in it from the point of view of resources that could be developed in these areas. Obviously in a number of areas mineral resources are paramount.

Senator Grosart: When you referred to ADA a moment ago, were you referring to the Area Development Agency or the incentives act, to ADA or ADIA?

Mr. Saumier: ADA, the Area Development Agency, which does not exist any more as an agency because that part of the Department of Industry's act which created the Area Development Agency has been repealed.

Senator Grosart: It is ADIA.

Mr. Saumier: No, it is ADA.

Senator Carter: There never was an ADIA.

Senator Grosart: Oh yes.

The Chairman: The legislation authorizing the federal Government to provide financial incentives for designated areas is still operating.

Senator Grosart: But there is an act on the statute book called the Area Development—

Mr. Saumier: Agency.

Senator Grosart: No, the Area Development Incentives Act.

Mr. Saumier: That act is still operative.

Senator Grosart: You were referring to the agency?

Mr. Saumier: The agency itself no longer exists, but the act is still operative.

The Chairman: But the department with its new integration can spend money for that purpose because that act has not been repealed.

Senator Grosart: Does ADIA come under your department?

Mr. Saumier: Yes.

Senator Bourget: ADA and ADIA do not apply to the northern part of Canada?

Mr. Saumier: The Northwest Territories no.

Senator Bourget: Do you intend to take some interest there?

Mr. Saumier: The legislation makes it clear that we have no mandate in the Northwest Territories. The whole mandate in the Northwest Territories is in the hands of the Department of Northern Affairs and Indian Development.

Senator Bourget: Due to the fact that you now have this experience and a good organization I think it would be a good idea for your department to take some interest in the north, where the people also need some help.

The Chairman: They want to remain small.

Senator Bourget: I did not say that.

The Chairman: Thank you very much, Mr. Saumier and your colleagues. We have been very interested this morning in finding out that at least in one field Canada has been successful due to your work to innovate. It is very refreshing indeed.

Merci beaucoup.

Mr. Saumier: Merci bien, monsieur.

The committee adjourned.

APPENDIX 44

BRIEF PRESENTED TO THE
SPECIAL SENATE COMMITTEE
ON SCIENCE POLICY

BY THE
DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

MARCH 1969

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*Agricultural and Rural Development Act
Fund for Rural Economic Development*

*Prepared by
Rural Development Branch
Department of Forestry and Rural Development*

March 1969

A

MANDATE OF ARDA/FRED(a) Research Contribution to the ARDA and Fred Programmes

The Acts administered by this group are:

1. The Agricultural Rehabilitation and Development Act (ARDA) amended in 1967 as the Agricultural and Rural Development Act.
2. The Fund for Rural Economic Development Act (FRED)

The main purpose of ARDA may be seen in the preamble to the Federal-Provincial Rural Development Agreement, April 1, 1965 to March 31, 1970, which states:

"WHEREAS rural areas and rural people are subject to widespread social, technological and economic changes that necessitate adjustments on the part of many rural areas and many rural people;

AND WHEREAS the income level and standards of living of many people in rural areas are unreasonably low;

AND WHEREAS there is a need in Canada for a more effective use of some lands; soil conservation and improvement; and the management, conservation and development of water resources;

....the purpose of the Agricultural Rehabilitation and Development Act is to undertake investigation and research on these needs and to undertake with the Provinces programs and projects for the more effective use of lands; for the conservation and development of soil and water resources in rural areas; and for the development of new opportunities for increased income and employment, and for improving standards of living for rural people;"

The purpose of the FRED Act is stated in Section 4(1) of the Act, under the heading, "Comprehensive Rural Development Programs":

"4. (1) The Minister may, on the recommendation of the Advisory Board and with the approval of the Governor in Council, enter into an agreement with any province providing for

- (a) the undertaking jointly with the province or any agency thereof of a comprehensive rural development program in a special rural development area; or
- (b) the payment to the province of contributions in respect of the cost of a comprehensive rural development program in a special rural development area undertaken by the government of the province or any agency thereof."

(b) Importance and Relevance of Research

One of the functions of ARDA is the undertaking of research projects on the particular problems of rural areas. The research functions can be considered in three parts:

1. General research. This would include such projects as the map series on economic and social disadvantage in Canada. These projects are not directly related to specific future development projects, but provide necessary general information on particular aspects of the problem of rural development.
2. Research preparation for ARDA projects. This research determines the nature and magnitude of particular problems and assists in finding solutions.
3. Research as part of the planning process under FRED. This provides the necessary data for professional analysis of the problems in a given area, and allows an assessment to be made of the priorities to be accorded to action in the different sectors.

(c) Objectives and General Nature of Research

Research that is directed towards future ARDA and FRED projects has as its objective the definition of the problems involved and the provision of sufficient data to enable professional analysis of the problems to be undertaken.

General research is aimed at the clarification of some problem of national or regional significance such as "The Dairy Industry." Research may be directed towards virtually any social or economic problem that may arise in rural areas.

The objectives of ARDA research are best summed up by quoting from Part I - Research of the ARDA Agreement:

" 12. The objective of this Part is to enable Canada and the Province to undertake jointly, physical, social and economic research concerning any of the projects or programs under this Agreement. Basic physical and biological research is not considered pertinent to the intent of the Act.

13. Approved projects or programs under this Part shall be selected from any or all of the following categories:

(1) surveys, studies and investigations aimed at establishing criteria and priorities for action under ARDA and assisting in the solution of rural problems and to develop programs and projects that qualify for cost-sharing under this Agreement;

(2) the formulation of Comprehensive Rural Development Plans;

(3) pilot action research specifically designed to test new program approaches to the solution of rural problems and the improvement of rural standards of living not allowed for in other sections of this Agreement. Such projects will terminate at an agreed time and participation in them shall not obligate Canada to participate in an extension of the projects thereafter, nor in any additional projects of this type;

(4) studies aimed at determining the feasibility of any project aimed at improving the income level or employment opportunities of rural people."

Pre-FRED research is undertaken under Part VI of the ARDA Act and forms a major basis for a FRED plan. viz:

"SPECIAL RURAL DEVELOPMENT AREAS"

31. The objective of this Part is to carry out a comprehensive rural development program in specially selected rural development areas.

32. These areas will be defined by the Provincial Minister and may be agreed to by the Federal Minister, subject to approval by the Governor-in-Council and the Lieutenant Governor-in-Council, as "Special Rural Development Areas".

Such areas warrant a comprehensive co-ordinated approach to economic and social development because they are subject to widespread low income; have major adjustment problems; and have recognized developmental potentials.

33. A comprehensive rural development programs involves the following:

(1) physical, economic, and social studies and investigations necessary to the determination of the development problems and potentials of the area;

(2) the involvement of local people through the establishment of rural development committees or similar bodies;

(3) the preparation of comprehensive rural development plans;

(4) the undertaking of a broad range of projects for the development of the rural development area in conformity with the development plans, to increase income and employment opportunities and raise standards of living as provided below."

Research Methods Employed

Commensurate with the varied nature of the research undertaken by ARDA-FRE², the methods employed have been varied. Methods have included:

social, survey field interviews

key informant interviews

secondary data analysis

case studies

library research

economic surveys - fields interviews non participant and participant observation

Special Committee

cost benefit analysis

pilot action projects

This is not an exhaustive list but covers the general headings. In some instances specific techniques have been designed to meet the requirements of the task.

In the case of ARDA-FRED it is not possible to define the internal structure of the unit directing research as the research is carried out by a wide range of people and is not the responsibility of any particular unit. In the case of FRED planning it is primarily a provincial responsibility, and general research is usually undertaken on a contractual basis. All cost-shared research is initiated and implemented by provincial ARDAs.

(d) Detailed account of Research Expenditures

Expenditures for ARDA-FRED research are shown in Tables 1, 2 and 3.

Table 1Research Expenditures under ARDA to March 31, 1968

	<u>No. of Projects</u>	<u>Fed. Expenditures</u>
A. <u>100% Federal Expenditure</u>		
1. First Agreement:		
a) Specific	95	1,883,180
b) General	<u>46</u>	<u>889,634</u>
	141	2,772,814
2. Second Agreement:		
a) Specific	62	2,347,004
b) General	<u>60</u>	<u>1,092,224</u>
	<u>122</u>	<u>3,439,228</u>
Total 100% Federal	263	6,212,042
B. <u>Shared Cost Programs</u>		
1. First Agreement:	125	3,260,148
2. Second Agreement	<u>180</u>	<u>7,732,059</u>
Total 50% Federal	305	10,992,207

Includes: Research for the purposes of FRED Planning is included in the above breakdown. A more detailed breakdown of these particular expenditures is shown in Tables 2 and 3 by FRED Agreements signed as of 31 March 1969.

Excludes: Expenditures for research under the Canada Land Inventory.

Table 2Research Expenditures on FRED Planning, First ANDA AgreementApril 1962 - 31 March 1965

	<u>% Federal</u>	<u>Number of Projects</u>	<u>Federal Expenditures</u> \$
Prince Edward Island	50	0	0
	100	0	0
North East New Brunswick	50	0	0
	100	3	117,507
Mactaquac New Brunswick	50	9	91,017
	100	1	21,388
Gaspé Quebec	50	6	1,312,024
	100	1	8,000
Interlake Manitoba	50	3	105,801
	100	13	308,378
TOTAL FIRST AGREEMENT		36	1,964,115

Table 3.Research Expenditures on FRED Planning, Second ARDA AgreementApril 1965 - 31 March 1968

	<u>% Federal</u>	<u>Number of Projects</u>	<u>Federal Expenditures</u> \$
Prince Edward Island	50	1	11,936
	100	3	701,356
North East New Brunswick	50	3	42,552
	100	3	143,961
Mactaquac	50	2	8,992
	100	0	0
Gaspe Quebec	50	17	1,679,927
	100	1	5,000
Interlake Manitoba	50	6	225,025
	100	6	213,777
TOTAL SECOND AGREEMENT		42	3,032,526

The Branch responsible for ARDA-FRED, inasmuch as it has no formal research unit has no research personnel. None of the Branch staff are assigned full time responsibility for research.

(e) Specific Research

Attached are resumes of two ARDA research projects. Although one might be justified in saying that most ARDA research projects are important within their own contexts, it would be impossible to say that any one research project is characteristic of ARDA research. Given the variety, we have chosen to append two examples which perhaps set outside limits for the work done.

Review of ARDA Research Report 1016

by K. B. Cooke
August 10, 1966.

I. Identifying Information

1. ARDA Research Project Number 1016
 2. Title: Cat Harbour: a Newfoundland Fishing Settlement
 3. Author: James C. Faris
 4. Contract with the Institute of Social and Economic Research, Memorial University of Newfoundland, St. John's, Newfoundland. (Newfoundland Social and Economic Study No. 3)
 5. Location of Study: (a) Newfoundland, (b) Census Division 8, (c) Village of Cat Harbour.
- Format: Multilithed (pre-publication reproduction for limited circulation. Original Ph.D. thesis on file at Memorial University.)
XI and 249 pages -
Maps, charts, figures, tables (plates in original) appendices and bibliography.

II. Relation of Report to Research Project Proposal

1. Summary of purpose of research.

"This study is an attempt to describe and explain a rural fishing community on the Northeast coast of Newfoundland..." as pointed out in both the proposal and the report, very little is known of the sociological background of community life in Newfoundland and there is almost no documentation of the outports in terms of historical context, traditions, beliefs and expectations of the inhabitants, ecology and social life. This research is part of several companion studies, which, when taken together will provide such documentation for various types of Newfoundland outports. The Institute of Social and Economic Research at Memorial "has developed as the first stage in its sociological research, a program of basic descriptive studies of different types of Newfoundland communities..." selected on the basis of predominant economic base (e.g. agricultural, logging, or fishing), religious denomination and population size and rate of growth or decline.

In addition to the objectives of providing background material of a sociological nature, it is intended that these studies will provide valuable information in relation to action programs such as the relocation and centralization of communities in Newfoundland. The proposal notes

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that the resettlement program at Markham is but one example of such a scheme, prepared and implemented at considerable cost, being entirely frustrated by social factors unrelated to the immediate issues.

2. The project proposal as approved by ARDA was adequate with respect to specification of terms of reference, statement of problem and qualifications of personnel. Copy of "outline and purpose of study" is on file.

3. The Report clearly states the purpose of the research on which it is based. See point II-1 above.

4. The objectives as stated in the proposal are met by the report and the research conducted. The obligations under the contract have been adequately fulfilled.

III. Resume of research as presented in Report

1. Part I - The Setting, deals with the history and the ecology of the Community, pp. 6-62, and describes both the natural and the social setting. Chapter II - History and Settlement, places Cat Harbour and its pattern of settlement in the context of the history of the Newfoundland outports. Cat Harbour was well-established by the mid-1700s. Permanent settlement in Newfoundland was legally prohibited for almost 200 years; up until 1824, and the author sees this as contributing to a settlement pattern that choose rather than avoided, inaccessible spots on the coastline. There is much folklore to the effect that the settlers on the "french-shore" where fugitives from justice and deserters from West Country (England) ships and that settlers deliberately avoided any harbours suitable for vessels bigger than a dory.

Cat Harbour was originally bi-denominational but mass emigration of the Roman Catholic families in the second half of the 19th century left it Protestant. Remnants of Protestant/Catholic - English/Irish antagonisms still persist.

The isolation of settlement has no doubt contributed to 19th century type of living existing in many outports in 1966. The current attitudes of the inhabitants towards strangers are traditional and there is historical precedent for hostility of strangers being the acceptable and "right" outlook.

Chapter III - the Natural Setting, discusses various aspects of the sea, the land, and the elements. Each of these sections looks at these aspects in a functional perspective of their role in the livings of the Cat Harbour inhabitant. The material is well-presented and documented.

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Chapter IV - the social setting is subdivided into three sections: A-demography, B-activity cycle and C-the outside world. The population of Cat Harbour was 285 persons (149 males and 136 females) in April 1964. Although precise population trends are difficult to ascertain, the actual rate of population increase was likely greatest between 1900 and 1935. The present birth rate is high but cannot compete with the rate of out-migration. Cat Harbour today is a dying community. Government centralization policies as well as expanded educational and training programs for the youth are hastening the process. Funds are presently available for relocation of families to the designated relocation centre of Lumsden South. Details of the number of families, "gardens" and housing facilities are given.

In discussing the "activity cycle", the author notes, "one measure of the particular Cat Harbour adjustment of the environment is the tremendous seasonal adjustment of activities." The regular cycle of "the voyage preparation and seal fishery, the voyage, the recupe (sic) and preparation for winter," and winter celebrations are outlined. One point may be noted of importance from the point of view of the sociologist: the lack of a functional differentiation (or specialization) of labour. To a very large extent, occupation, family, residence and social living are geographically coterminous. While there is a distinction between what a man is expected to do and "women's work," each man is almost of a jack-of-all trades. Specialized services aside from those connected with marketing of fish and selling supplies are virtually non-existent.

The line of demarcation between Cat Harbour and the outside world presses in closely around the community. Maps are included showing the "outside" lines for "local" services and for the wider socio-economic area which encompasses the "universe" for Cat Harbour with the exception of the sea and St. John's. This is a very limited world, circumscribed until very recently by lack of transportation facilities, a traditional distrust of "outsiders" and a pattern of intra-community-focused social interaction.

Part II - Territory, Kin and Crew, focuses on the social interaction patterns that have emerged in relation to the circumstances described in Part I, regarding residential arrangements, kinship concepts and economic units and the fishing crews. Chapter V deals with residence and describes (subsection A - domestic structure; houses and households) the variations in dwelling arrangements. There are three distinguishable types of households: (1) the "elementary" family comprising man, wife and unmarried children (74 per cent of households); (2) type (1) plus one or

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more kinsmen, e.g. a single surviving parent (21 per cent); and (3) two "elementary" families under one roof but comprising two separate consumption units (5 per cent).

Houses are inheritable property usually going to the youngest son. Except in exceptional circumstances, women do not inherit property. The land tenure system (discussed in subsection B) is somewhat complicated. Much of the land, except that fronting on the ocean, is not owned by deed but by possession. Fragmentation of holdings permits sons to acquire parts of father's land.

Chapter VI - kinship deals in detail with such arrangements. The focus is on the patrilineal family and to a considerable extent women in general and the wife's family (unless patrilineally related to local family) are regarded as outsiders. The local usage and connotation of the various terms -- "crowd," "clan," "cunny kin," "fork kin," -- are discussed.

Under the heading, sex and age, the report notes the local attitude-set which makes a marked distinction between men and women. Women are on the whole regarded as "strangers" and may be witches. Boats in the outport are referred to as "he" since dependable things are male and those of female gender are undependable. Age does not confer increased prestige. In local parlance, different age groups may be denoted by the term "race," and each age group or "race" has a set of proper-behaviour expectations relating to it.

Marriage to local women is to be preferred but a majority of the wives come from outside Cat Harbour. This is partly related to the fact of intra-kin marriages being prohibited and partly to the increasingly great out-migration of young girls to St. John's and elsewhere. Cat Harbour is a "man's world" and opportunity for these girls lies elsewhere. Divorce is essentially unheard of in this outport and "unhappy" marriages are solved by impersonalization of relations between spouses. "pre-marital sexual relations are universal and accepted, in spite (sic) of the recent endeavours by the clergy (page 114)."

Chapter VII - The Fishing Crew discusses the "ideal" arrangement and the actualities in practice. This is mainly in terms of who fishes with whom and there is little description of size of boat, how many men are required by such a boat and other "exigencies of the situation".

Part III - Dynamics of Interaction: the Cat Harbour moral community begins in Chapter VII with the following paragraph.

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Thus far I have discussed the Cat Harbour historical, ecological and social setting; and its implications for discernible patterns of organisation i.e., the way people live together, work together, and view their physical relationships -- the frameworks of interaction. It has been my argument that ecological factors are very important in understanding these patterns. But this is not all, for in the local idioms of interaction, the local patterns of relationships, there are dynamic elements and principles which can be abstracted to illustrate how relationships are made continually operative -- how interaction is maintained. These dynamics of interaction will constitute the main topic of discussion in Part III.

This review will not attempt to summarize the eighty odd pages comprising Chapters: VIII - The Moral Order, (A) Leadership and Authority, and (B) Sanctions and Conformity; IX - Economics, (A) the Voyage, shares and income returns, (B) Mercantile Capitalism, the traditional outport economics of debt, credit and obligation; X - Religion, (A) The Church and the Kingdon Hall-Outport Christianity and (B) Causality and the Supernatural; XI - The Structure of Verbal Communication; and XII - Occasions, (A) funerals and (B) The "Times (occasions for celebration)". A very interesting picture is presented herein and those points considered by the reviewer to be particularly relevant to programs under ARDA will be noted below re assessment of findings and recommendations.

IV. Evaluation of Report and Research

1. Presentation

Presentation of the material in the report is good and the report is well written. Because of technical difficulties in reproduction, one map, the charts, several figures and the plates are not contained herein. They are available in the original thesis (Ph.D. on file Memorial University Library). Since this is regarded as a "pre-publication" edition such a procedure is excusable. Some of the plates obviously would have facilitated individual identification of persons involved in the study and would not be included in the published form in any event.

The report is not concise but I am not at all sure this would be a desirable characteristic. However, if the report is to be published the degree to which the report is cut will depend on the intended audience. For the ethnographer who wishes to read an ethnographic account, it may well be that very little can be omitted. A good deal of the detail that the ethnographer may want, does little to help the reader who wants a

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description and analysis of a type of community living with which many of us are totally unfamiliar.

Table format could be improved. Some of the tables are difficult to read and tend to merge with the text.

If the report is to be published for a "lay" audience, unfamiliar technical terms should be changed or definitions provided.

2. Methodological considerations.

As noted in the project proposal, the ethnological approach used in this research involved the participant observation by a graduate fellow who lived in the community of Cat Harbour for one year. In addition, various documents were consulted in relation to background, historical context, local ecological factors, and activities of various organizations. Inasmuch as the situation portrayed -- that existing in the outport -- is a bit "foreign" to most of us as a 20th century way of living, the description of a fishery-oriented outport provided by this approach, is a major contribution. The skilled participant observation of a trained ethnographer is one of the few ways in which an accurate portrait may be obtained. In short, the method used was suitable to research done, documentation is adequate and bibliography may be helpful in other contexts as well as the present one.

3. Assessment of findings and recommendations.

Strictly speaking, there are no recommendations contained in this report. This is in keeping with the objectives of the research. However, in assessing the findings there are several implications that may be viewed in relation to planned or proposed action programs (e.g. relocation and resettlement of Newfoundland outports). This review will not attempt to cover all these but to highlight those that in the reviewer's opinion are most relevant. These are areas to which a good deal more attention should be given than is possible here.

A. The prevailing communication and social process patterns in Cat Harbour may be characterized as "primary" in distinction to secondary patterns occurring in industrialized areas. For example, one speaks ones message when one meets another (or seeks him out) in Cat Harbour -- in Toronto, for the same message, one telephones or writes a letter. The inhabitants of this and likely most other outports have not experience with secondary modes of communication and social process. This is a "social fact" that probably should be taken into account in relocating these people. The youth who migrate out of such outports learn the hard way (there is a lovely story about a charming young secretary who followed her native Newfoundland custom in Montreal and said a cheerful hello to all she met as she walked the three blocks each morning to work and when coming home

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at night. The results were totally incongruent as far as her expectations were concerned), but it may be that the obvious will have to be dealt with more explicitly particularly when relocation of older persons within Newfoundland is involved. The combining of several outposts into one community will increase the quantity of interaction and the numbers of people with whom one has to interact to the point where continuation of solely primary modes of communication and social interaction may produce frustration, hostility, etc., rather than the expected results.

B. A related area of life in Cat Harbour is the general lack of functional differentiation and specialization or division of labour. This is in direct contrast to the increasing trend in industrialized areas towards specialization and division of labour. Again, the residents of such an area are ill-equipped in terms of past experience, social expectations and established habit patterns. They are, in a sense, living a life no longer characteristic of Canada as a whole.

C. The prevailing notions and expectations re leadership roles and the accepted patterns of decision-making may hamper the adjustment of these people to modern living. The author notes (pp. 132-3) the reluctance of Cat Harbour residents to accept formal leadership.

Leadership and exercise of authority involve taking decisions which may be binding on other, and in Cat Harbour anything which in this overt way infringes on another is considered aggression and a serious breach (of expected behaviour). . . .

In the hierarchical structure imposed on the community by outside institutions, such as the officers of the Church or the Federation of Fishermen Governing Committee, candidates for positions are never forthcoming and once a man is elected to such a position, his tenure is likely to be for life. Making decisions which may be unpopular is certainly one factor inhibiting office holders, but simply making any decisions affecting others is difficult in the traditions of the Cat Harbour moral community.

This pattern is documented in almost all contexts of Cat Harbour living. If this pattern transfers with relocation, it may raise many barriers to relocation, adjustment, rehabilitation as well as to more specific situations such as establishing ARDA rural development committees. It might be noted that other evidence (observation of reviewer and others) suggests this tendency is not only recognized by provincial government officials and others in positions of authority in St. John's but may even be viewed as the ideal situation.

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D. The report also notes that change is occurring in many aspects of out-port life. For instance, the role of the Church is changing; that of the merchant whose role is being forced to change with the passing of mercantile capitalism in the larger society; the role of women, both in the home and in relation to occupation. The implications here need further analysis and this report will be useful for background.

V. General Comments of Reviewer

1. This report is suitable for publication as an academic paper. I do not recommend that it is one which we should publish primarily because it is a "scientific paper" and should be issued as such for those persons interested. There is little of this kind of material available particularly for Newfoundland and either the Author or the Institute should be encouraged to publish it. One might note in passing that although the editorial and typing services provided at Memorial has improved (over the quality of earlier reports received), there are wonderful idiosyncrasies in spelling, punctuation, etc.

I am sending a copy of this review to Dr. Robert Paine at the Institute of Social and Economic Research unless you have any objections to this procedure.

2. There is no necessity to refer this report to other disciplines for review unless it is desired to have the evaluation of a professional in the field of ethnography or social anthropology. For ARDA's purposes, this would be nice to have in terms of long run perspective re research standards per academic discipline but it does not seem necessary to me at this time.

I do recommend that copies be forwarded or called to the attention (copies may be obtained by writing directly to the Institute) of each Department of Sociology in Canadian Universities, to the federal departments or agencies having direct or indirect interest in this kind of research and to such groups as the Canadian Centre for Community Studies, Canadian Council on Urban and Regional Research, Canadian Welfare Council, Atlantic Provinces Research Board, and so forth. There is no point in our duplicating distribution already made by the Institute at Memorial, I am rather suggesting that we supplement it - particularly with respect to such agencies as the Atlantic Development Board (copy sent to AI Crerar), ADA and Manpower as well as Fisheries.

"Summary Report on Pilot Research Region,
Northern New Brunswick" ARDA 4022, 1965.

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AND INSTITUTIONAL ARRANGEMENTS

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INTRODUCTION

This report presents the findings of a research program carried out in northern New Brunswick by Lockwood Survey Corporation Limited (successors to Hunting Survey Corporation Limited) for the Canada Department of Forestry, Agricultural Rehabilitation and Development Administration. The study was authorized in an agreement made on January 8, 1964 by the Minister of Agriculture and the corporation.

THE RESEARCH REGION

The research region comprises Gloucester County, Addington, Dalhousie, Balmoral, Colborne and Durham parishes of Restigouche County, and Alnwick Parish of Northumberland County (see Figure 1). This area had been designated a Rural Development Pilot Research Region and, more recently, has been designated a Rural Development Area for purposes of carrying out action programs.

ORGANIZATION OF THE REPORT

The results of our investigations are presented in seven volumes. The present volume contains a statement of the scope and objectives of the research program and a summary of the program's findings and recommendations; it has been prepared with a fairly wide distribution in mind. The other six volumes constitute the technical report and are intended for more limited distribution, particularly to those persons and agencies that will be directly concerned with formulating action programs for rehabilitation and development in the region. A single volume is devoted to each of the following subjects: agriculture, forest development, the inshore fishery, employment, characteristics of the region's population, and additional development possibilities.

OBJECTIVES OF THE RESEARCH PROGRAM

The research program had one main purpose, namely to provide information that policy-makers, planners, and public and private investors require in order to make intelligent decisions concerning the promotion of balanced and orderly economic growth and social development. More specifically, the program had several objectives, which may be summarized under the following headings.

1. To assemble and evaluate the existing information on natural resources and human activities and, where necessary, to supplement it by field studies.
2. To ascertain, by special field studies, the costs, returns, living levels, and other features of (a) enterprises in farming, fishing and forestry and (b) rural non-farm enterprises and households not primarily engaged in these three activities.
3. To determine the inter-regional competitive position of various types of primary resource-

based enterprises.

4. To assess existing policies and institutional arrangements as they affect resource use and other human activities.
5. To identify the opportunities for promoting orderly economic growth and for increasing incomes and employment in the region.
6. To specify the investments, incentives, training programs, and new administrative and institutional arrangements that will help to ensure that these growth opportunities are taken up.

If Canada is to achieve its economic growth and regional growth objectives, it must find solutions to the chronic low-income problems of areas such as northern New Brunswick. There is growing recognition that our society is under an obligation to provide at least a minimum income or a minimum level of living for all its members. We recognize too that society has an obligation to provide equality of economic opportunity for its citizens, no matter where they reside. To provide equality of economic opportunity and at least a minimum level of income for each individual and each family would ensure that the misfortunes of the parents are not visited on their children. This would in turn ensure that poverty itself is not self-perpetuating. In our society such a program is not philanthropy; it is the cornerstone of economic and social progress.

SCOPE AND METHODOLOGY

General Considerations

For obvious reasons, our research effort was focussed mainly on conditions and prospects in the rural development pilot research region. However, for certain insights we were obliged to look beyond the region. In making comparative analyses, in assessing the region's competitive advantages and disadvantages in certain primary resource-using enterprises, we have resorted to data pertaining to other parts of New Brunswick and other provinces in Canada. Moreover, it became evident during the early stages of our study that resource use and development prospects in the region have been strongly influenced by existing government policies and institutional arrangements of provincial or national scope. We have examined the role played by those policies and arrangements that have special relevance to the research region, and we make no apology for having done so; in fact we would argue that boldness in creating new administrative and institutional arrangements is a prerequisite for successful rehabilitation and development programs in disadvantaged regions such as that in northern New Brunswick.

A detailed investigation of the probable ramifications of the new industrial developments at Belledune was beyond the scope of the present study. Indeed, the full magnitude of these developments was not apparent at the time we carried out our field survey program. Belledune appears destined to emerge as the major population growth node and industrial centre of the rural development area. The developments there will have a tremendous direct and indirect impact on resource use and people in the area. It is exceedingly important that the Belledune developments be guided and supported in such a way that they make their maximum possible contribution to resolving the problems of the area.

We have one further point to make. The recommendations resulting from our study are concerned with a wide range of development programs, including comprehensive programs for education, training, and labour force mobility, the formulation and application of administrative arrangements, and the undertaking of specific projects. In framing these recommendations, we have deliberately chosen not to specify the agency or agencies that should be responsible for implementation. We believe that the institutional arrangements and policies that have been created or appear likely to be created are sufficiently comprehensive in scope and range to accommodate all of our recommendations.

Physical Resource Studies

The mapping of physical resources and existing resource uses did not constitute a major part of the research program. Most of this information already existed in published or manuscript form and was made available for our use. Geological maps and reports were obtained from the Geological Survey of Canada and the New Brunswick Department of Lands and Mines. The latter department also supplies detailed maps showing the distribution of freehold and provincial Crown lands. The mapping of soils and soil capability was carried out during 1963-1964 as a joint program by officers of the Canada Department of Agriculture and the New Brunswick Department of Agriculture. The Geographical Branch, Department of Mines and Technical Surveys, made available manuscript land use mapping on a photo-mosaic base. The provincial forest inventory provided many useful data for our forestry studies. However, its results are presented in statistical rather than map form and, accordingly, we considered it necessary to carry out a modest forest cover mapping program of our own.

Agricultural Studies

The main objectives of our agricultural studies were 1) to define the potentialities for growth in the commercial farming sector, 2) to identify the opportunities for introducing labour-intensive agricultural activities that could provide employment for rural non-farm people, and 3) to suggest institutional arrangements appropriate for promoting these types of development.

In order to achieve these research objectives we carried out a number of non-economic and economic studies. The two main non-economic studies were concerned with describing the physical resource base and its existing use and with defining the importance of farming in human terms. Our economic studies were concerned with determining the resources available to farmers, defining the living levels and incomes of farmers, comparing the inputs, outputs, costs and returns of farm enterprises elsewhere, and determining the effects of existing institutional arrangements on agricultural resource use.

Forestry Studies

The main objectives of our forestry studies were 1) to provide the information that policy-makers, planners, and investors require in order to make intelligent decisions concerning orderly development in the forest resource sector of the economy, and 2) to evaluate the various kinds of new institutional arrangements that would facilitate such development.

The major emphasis in the study was placed on determining the prospects for development

of the freehold forests of the region and for increasing the incomes of freehold forest users. Company operations on Crown lands were not examined in detail; indeed, we have assumed that rationalization of these operations and adjustments in the labour force that they employ will continue to take place mainly as policy considerations and economic forces dictate.

In achieving our study objectives in so far as freehold forest operations are concerned, we carried out studies of growing stock, holding size, logging methods, forest management, employment, pulpwood supply and demand, costs and returns involved in small-scale forest operations, investment prospects, assessment, and institutional arrangements.

Studies of the Commercial Inshore Fishery

The objective of the fisheries study was to examine the utilization of the fishery resources in order to evaluate the means by which the incomes of fishermen can be raised. For reasons explained in the text, attention was focussed almost exclusively on the inshore fishery. In achieving our stated objective, we defined the marine resource, conducted a field survey to determine the incomes, costs and returns, and other features of inshore fishery enterprises, carried out a production function study to determine the relationship between the inputs of the various factors of production and the resulting output of products, and evaluated existing regulations governing the inshore fishery.

Study of the Rural Non-Farm Group

Since rural non-farm people greatly outnumber the commercial farm population in the research region, great concern must rest on the prospects that these people have for playing a productive role in regional economic life. A field survey involving questionnaire procedures was carried out in order to determine the economic status and social attributes of this group.

Labour Force and Human Resource Studies

Our labour force and human resource studies have lead us to make major recommendations concerning investments in education, training, and mobility. In developing these recommendations we relied heavily on unpublished data supplied by the Dominion Bureau of Statistics and the Canada Department of Labour. We also made extensive use of case records kept at National Employment Service offices and the headquarters office of the New Brunswick Department of Youth and Welfare, Social Assistance Division.

Economic Studies

Our major research effort was applied to investigating the economic aspects of the various types and scales of enterprises in the region. The objectives of these studies are summarized earlier in this introduction and need not be re-stated here. Our approach to resolving the data problems of the economic studies included the use of such methods as formal sampling, field surveys, case studies and interviews, as well as study of every relevant secondary source of data. The formal data assembled in the field were subjected to analysis using computer programming

techniques, as described in Parts I and III of our technical report.

In our economic studies, we may appear to be concentrating on improvements in resource use, placing special emphasis on agriculture, forestry and inshore fishing. However, we would point out that we are primarily interested in developing a plan for using resources in such a manner that the people of the region obtain increased income, that they share in a more equitable fashion the income available, and that they are given an opportunity to achieve the highest income possible commensurate with their ability.

Traditionally, in their analysis of natural resource industries, economists have tended to emphasize resource efficiency criteria; to a certain extent they have ignored income distributional criteria and effects. If they discussed income distribution at all, this was done in order to indicate how improved resource allocation affected income distribution.

In most studies, the resource efficiency approach was warranted. However, we did not feel that it was the most appropriate approach for this particular study. Economists are now increasingly addressing themselves to low-income problems generally and to the problems of chronically depressed areas in particular; in our own study, we have taken into account not only efficiency criteria but also income distribution criteria.

PERSONNEL

Four staff members of Lockwood Survey Corporation Limited took part in the survey: I. S. Fraser (Project Manager, report editor, labour force and human resource studies), D. H. Recter (studies in agricultural economics), J. R. T. Andrews (forestry studies), and G. S. Groves (study of the commercial inshore fishery). Professor C. B. Haver, Department of Economics, Macdonald College, McGill University, was retained as consultant in resource economics for the duration of the project. D. Lingeman, K. J. Joseph and J. W. B. Urquhart carried out short-term data compilation assignments.

REPORT ON SCIENTIFIC ACTIVITIES

Prepared by
CANADA LAND INVENTORY
DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT
for
THE SENATE COMMITTEE ON SCIENTIFIC POLICY

March 1969

Special Committee

SCIENTIFIC RESEARCH ACTIVITIES
as carried out by the
CANADA LAND INVENTORY

Authority of Mandate:

The Canada Land Inventory was established under the Agricultural Rehabilitation and Development Act assented to June 22, 1961, and amended to Agricultural and Rural Development Act and assented to May 12, 1966.

Under Part 2, Section (2), of the revised Act the authority is stated as follows:

- 2.(2) The Minister may cause to be prepared and undertaken, directly or in co-operation with the government of any province or any agency thereof, programmes of research and investigation respecting the more effective use and economic development of rural lands in that province.

Historical Background:

1. The Special Committee of the Senate on Land Use in Canada, No. 4, August 20, 1958, recommended as follows:

That it be called to the attention of the proper authorities the need of a systematic land use survey based upon appropriate factors to provide for an

economic classification of the land according to its suitability.

This recommendation was restated in Proceeding No. 12, July 8, 1959.

2. The Resources for Tomorrow Conference, Montreal, 1961. Each of the Agriculture, Forestry, Wildlife and Recreation Workshops recommended Land capability studies which resulted in a joint statement by research coordinators as follows:

The Conference affirmed the following needs:

1. To complete a country-wide assessment of resource supplies which may be set against long-term assessment of resource needs.
2. To make possible systematic studies of:
 - (a) Problems of resource management and development in all fields; and
 - (b) Economic potentials and social needs in all regions.

Formal federal-provincial consideration of the Canada Land Inventory took place in November 1963 when a Memorandum on the subject was presented to the Canadian Council of Resource Ministers. This

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Memorandum put forward by the ARDA Administration stated the need for the Inventory, outlined its proposed scope and presented recommendations for a division of responsibilities. The Canadian Council of Resource Ministers approved the proposal in principle and recommended that the Inventory proceed on the basis of working agreements between individual provinces and the ARDA Administration.

On October 3, 1963, the Government of Canada approved the undertaking, under ARDA, of this comprehensive land resource inventory.

Relevance and Importance of Research
Activities to the Program:

Very early in the ARDA program it became obvious that rural development could only be achieved if land use rationalization were achieved. This would involve consolidation of farms located on high capability soils into viable units, but equally important the conversion of submarginal agricultural lands to alternative uses for which they are physically suited and from which positive economic returns could reasonably be expected. In the absence of objective information with which to

classify soils as to their capability for agriculture it was decided, in association with provinces, to map the soil capability for agriculture of the settled areas of Canada, approximately one million square miles. In order to provide objective information on the best alternative uses it became necessary to map the same areas for their capability for forestry, for recreation and for wildlife (ungulates and waterfowl). To relate use to capability for planning purposes the mapping of present land use became necessary.

In view of the absence of definite development regions at that time and because of the value attached to the data by the provinces, mapping of the settled area of Canada was undertaken. (See attached map.)

From a number of alternatives it was decided, if possible, to have the provinces accept responsibility for the program and ARDA would finance the additional costs of each province. Co-ordination of each program was arranged with the responsible federal departments or agencies and the necessary positions, as well as additional costs, were guaranteed. In addition, each federal department involved in the program seconded senior co-ordinators to ARDA for the duration of the Inventory.

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National classification systems for each sector were drawn up, discussed with and agreed to by all provinces and pilot scale projects were carried out to ensure feasibility of the systems.

As a compromise with the provinces two scales of maps are prepared - one, in fact, being a generalization of the other. The scale for planning is 1:50,000 and these maps are generalized to the 1:250,000 for publication. Examples of the published maps are included as part of the submission.

The program will result in about 20,000 maps at the larger scale and 1,000 at the smaller scale. In order to make this mass of data readily available and manageable for multiple comparisons, it became necessary to design a computerized systems to convert mapped data into digitized information on tape, store the information, carry out multiple comparisons, and output information in form and for regions required. The Geo-Information System, unique in the world, was developed for this purpose. The Geo-Information System will be the subject of a separate submission and, thus, the only purpose here is to place it in context with the Canada Land Inventory program.

As the date became available it was obvious that it would have to be tested in land use planning projects in order to assess its adequacy for the purpose for which it was designed. Thus land use planning pilot projects have been financed in each province that wished to carry one out. To date British Columbia, Nova Scotia and Prince Edward Island have initiated projects and in 1969 projects are expected in New Brunswick, Quebec, Manitoba and Alberta.

In summary the program consists of:

1. Land Capability for Agriculture
2. Land Capability for Forestry
3. Land Capability for Recreation
4. Land Capability for Wildlife (Ungulates and Waterfowl)
5. Present Land Use
6. Geo-Information System
7. Land Use Planning
8. Economic Studies to relate feasibility to capability.

Objectives and General Orientation
of Research Activities

The objectives are to:

1. Provide an objective base for program formulation and evaluation.

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2. Provide a base for land use planning either in association with general resource programs, or in development plans for special areas.
3. Encourage the provinces to rationalize land use within their jurisdictions.

The program is more than half completed and the objectives are already being fulfilled. The data have become one of the main planning tools in:

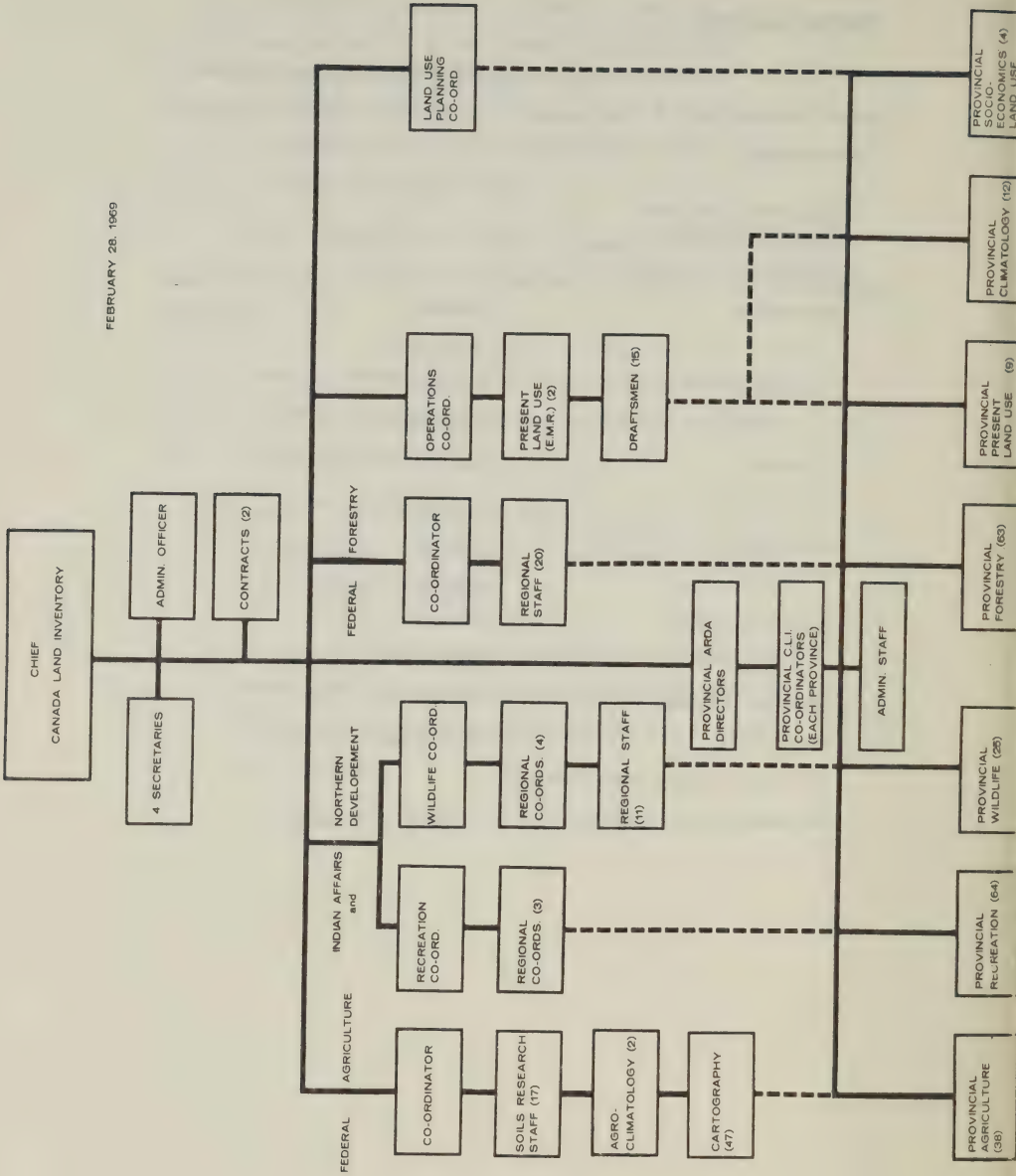
- (a) Resource programs such as drainage support, community pastures, irrigation schemes, reforestation, and others supported by ARDA.
- (b) Special Rural Development (FRED) plans such as Northern New Brunswick, Prince Edward Island, Lower St. Lawrence, and Interlake of Manitoba.
- (c) Purely provincial resource programs such as recreation plans, development plans, reforestation plans, land disposition and alienation policies, and pulp and paper mill location.

Research Structure:

An organization chart is attached to indicate the structure as of December 1968. A brief summary of professional and technical staff is as follows:

Head Office Employees (Rural Development)		4
Head Office (Seconded)		4
Agriculture	- federal	19
	- provincial	38
Forestry	- federal	20
	- provincial	63
Wildlife	- federal	15
	- provincial	25
Recreation	- federal	3
	- provincial	64
Present Land Use	- federal	2
	- provincial	9
Land Use Planning	- provincial	60
Others	- provincial	16
Provincial Program Administrators		9
Cartographers and Draftsmen	- federal	<u>62</u>
		413

FEBRUARY 28, 1969



Internal:

As of February 1969 the staff details are as follows:

(a) Rural Development Staff

<u>Birthplace</u>	<u>Last University Degree Obtained</u>	<u>No. of Years with Agency</u>	<u>Years on Labour Market</u>
Canada	M.Sc. - U.S.A.	5	17
Canada	M.A. - Canada	3	5
Canada	M.A. - Canada	1	3

(b) Seconded Staff

<u>Birthplace</u>	<u>Last University Degree Obtained</u>	<u>No. of Years with Agency</u>	<u>Years on Labour Market</u>
Canada	M.Sc. - U.S.A.	5	10
Canada	Ph.D. - U.S.A.	1	10
Canada	Ph.D. - U.S.A.	2	20
Canada	M.S.A. - Canada	5	25

Of the seven co-ordination staff all have ability to work in English, three are fluently bilingual and two additional are adequate in French.

The staff employed by other government departments and by the provinces who are engaged in the Inventory program will be reported by their parent agencies.

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Budget:

Expenditures to March 14, 1969, from the beginning of the Program are as follows:

1963-63	\$ 4,000
1963-64	159,855
1964-65	486,785
1965-66	862,518
1966-67	3,210,858
1967-68	6,179,202
1968-69	2,957,557
(to March 14)	<hr/>
	\$13,860,775

Summary of Selected Projects, 1963 to 1968:

In addition to the program outlined earlier, a few examples of projects are listed to indicate the type of parallel research being supported.

1. Economics of Plantation Forestry in Southern Ontario, by D.V. Love (University of Toronto) and J. R. M. Williams (Ontario Department of Lands and Forests).
 - benefit/cost analysis of planting white spruce and red pine on submarginal agricultural lands in Southern Ontario.
 - final report in the process of printing.

2. An Analysis of Shoreland Use and Capability for Cottaging in the Georgia Lowland of British Columbia in Relation to Canada Land Inventory, By Colin K. Campbell.
 - to test the assumptions made in the recreation capability classification system respecting relative capability of natural shoreland types to engender and sustain recreational uses.
 - report published September 1967.
3. Climates of Canada, by L. J. Chapman and D. M. Brown, Ontario Research Foundation.
 - to analyse pertinent meteorological data and prepare maps and a report dividing Canada into homogeneous climatic zones for agriculture.
 - Canada Land Inventory Report No. 3, 1966.
4. Socio-Economic Studies - British Columbia, by C. Verner, University of British Columbia.
 - to conduct socio-economic studies in selected regions of British Columbia to relate socio-logical and economic factors to physical capability properties of land.
5. Economics of Agriculture on Various Soil Capability for Agriculture Classes in Southern Ontario, by D. W. Hoffman, University of Guelph.
 - to assess economics of various types of agriculture on the various national capability classes for agriculture.
 - project now ongoing.

Publications:

1. The Canada Land Inventory - Objectives, Scope and Organization
CLI Report No. 1, 1965.
2. Soil Capability Classification for Agriculture
CLI Report No. 2, 1965.
3. The Climates of Canada for Agriculture
CLI Report No. 3, 1966.
4. Land Capability Classification for Forestry
CLI Report No. 4, 1967.
5. Land Capability for Forestry - Guidelines for Mapping, 1968.
6. Land Capability for Recreation
Preliminary Report, 1965
Final Report in process of publication.
7. Land Capability Classification for Wildlife
Preliminary Report, 1966
Final Report in process of publication.
8. An Introduction to the Geo-Information System of the Canada
Land Inventory, 1967.
9. Forty-five (45) maps at 1:250,000 scale for various parts of
Canada.
10. Land Use in Canada - The Canada Land Inventory Canadian
Geographical Journal, 1968.

A GEOGRAPHIC INFORMATION SYSTEM FOR REGIONAL PLANNING

Canada, like many countries, faces an immense problem in both understanding and guiding the development of its land, water, and human resources. One of the major agencies created specifically to implement policy to attack this problem is the Rural Development Branch of the Department of Forestry and Rural Development. A primary task facing this agency is to assemble social (demographic), economic, and land data for an integrated analysis to enable problems of rural development to be specified, development programs to be implemented, and their effectiveness evaluated.

Parallel with the gathering of data has been the development, by the Regional Planning Information Systems Division of the Branch, of interrelated computer-based information systems to handle and analyse the data. The Geographic Information System, for the storage and manipulation of land data, is the most developed of these systems. Its design and development started in 1963, implementation began in 1965, and is now in its final stages; routine use is scheduled for September 1968. It is perhaps worthwhile to recount our progress with this system at this time.

Early in the life of the Branch (1962) a start was made with the gathering of some kinds of land data by the Canada Land Inventory. The data they collect is restricted to five types: the present use of the land, the capability of the land for agriculture, the capability of the land for forestry, the capability for recreation, and the capability for supporting wildlife. These data alone, if gathered in sufficient quantities for the summaries to be directly applicable to provincial and federal resource policy and regional planning, will generate an estimated 30,000 map sheets, at various scales. The Inventory has currently produced 7000 map sheets, of which 3000 have been prepared for computer input. The maps contain an average of 800 distinct areas on each sheet, and have been found to contain as many as 4000. Additionally, other types of maps covering watersheds, climate, geology, administrative boundaries, and land titles are generated by other agencies.

The need for a computer-based system, whereby map and related data can be stored in a form suitable for rapid measurement and comparison, is apparent as soon as the magnitude of the problem of handling large numbers of maps is appreciated. Lack of trained personnel makes it impossible to examine such large amounts of data manually in any sensible time, much less to provide a meaningful analysis of the content. A situation can be reached where the amount of data precludes its use. The end product of countless hours of survey can remain unused, with the result that administrators do not receive information necessary for a sound basis to decision making.

From the first, it was the intention to produce the maps generated for the Canada Land Inventory in such a way that their data could be related on a nation-wide basis by the geographic information system. This made it necessary to establish a common basis of data description. Classification systems were evolved for each type of data by discussions with the federal and provincial agencies concerned in the original survey, under the guidance of a federal co-ordinator. In each case, the classification systems were subject to trial in pilot areas in various regions of the country. Regional variations are incorporated into the classification system by development of ratings which recognize equivalent values. The classification systems vary from a relatively simple, one-letter code for present land use to a complex, multi-level description used for forestry.

The maps, essentially interpretations of existing data in terms of the classification system, are usually produced by the federal and provincial agencies most closely related to the collection of the original data (over 100 agencies are involved). The manuscript maps are sent to Ottawa to be edited and prepared for computer input.

The basic capability of the geographic information system is that it accepts and stores all types of location-specific

information, that is, any information which can be related to an area, line, or point on a map. Information relating to land resources is most frequently location-specific in character. For example, census data (perhaps not usually thought of as location-specific) are collected from specific areas of land called enumeration areas, which are recorded on maps; a highway is a location-specific line; a campsite can be thought of as a location-specific point on a map.

The system can best be described as comprising two parts: the data bank and the set of procedures and methods for moving data into the bank, and for carrying out the manipulations, measurements, and comparisons of the data, once there. These two parts will be referred to as the 'data bank' and the 'information system', respectively. It is quite possible to have the entire geographic information system with full operating capability and have no data in the data bank. The amount of data which can be put into the data bank is infinite, as any number of magnetic tapes can be generated and stored. Additional data related to any area can be inserted at any time.

The system has the following capabilities:

It will accept maps containing data represented as areas or lines or points. The maps can be of any scale and on any map projection, and they can contain linear distortions. All of these characteristics will be adjusted to a standard format (normalized) when they are put in. Data relating to points only can be put in independently of maps. They are simply related to their latitude and longitude points.

The system compacts and stores information. The compaction is most efficient. For maps at a scale of 1:50,000 with an average density of information it is expected that a complete coverage of the farmed area of Canada (approximately 600 map sheets) can be recorded on two reels of magnetic tape.

The system can measure any data in the data bank. If the data have been inserted in the form of areas, then each area

can be measured. For example, a soil map might be represented by different areas of different soils. The area of each patch of soil or the total area of any one type of soil can be calculated.

Similarly, the lengths of lines can be measured and the occurrences of points counted.

The region from which area, line, or point measurements are required can be limited in a variety of ways. Data can be retrieved within any boundary already described to the system. If, for example, a map of administrative region boundaries has been put into the data bank, measurements can be carried out within a specific administrative region. If a desired boundary has not already been described to the system it can, of course, be drawn on a clean sheet and inserted in the normal way, or if it is simple enough in shape to be described by a straight line joining points, then it is only necessary to put in the co-ordinate values of the points.

It will also be possible to limit retrieval by reference to any line or point already described to this system. The system can be asked, for example, to measure the area of patches of land crossed by the line of a highway or within a band of specified width along the highway, or to determine the areas suitable for sub-divisions within 20 miles of the centre of a city.

A major system capability is comparison of two types of mapped data relating to the same area. Just as two maps can be manually overlaid to allow the relationships between the data to be examined, the system can overlay any two or more types of data to measure the exact amounts of each type of land in juxtaposition to the map or maps below.

This can be applied as a search capability, whereby a comparison of various types of information is made to find out where a selected set of characteristics occur together. For example, a request to find suitable landing sites for a helicopter would require an examination of the vegetation map to determine treeless areas, the topographic map to make sure that the area was flat, and the present land use map to make sure that the area was not populated. These three coverages would be compared to identify and describe all points having the desired characteristics.

A further extension of the search capability could result in a 'search in context'. A potential helicopter landing-site, for example, would be of limited value if, while being perfectly treeless, flat, and uninhabited, it occurred as an island in the middle of a swamp. The search routine can be instructed to ignore otherwise desirable sites if they do not occur in a desirable context.

Another search capability that can be implemented is referred to as the 'nearest neighbour search'. This would be employed when the limit of the search is not definite enough to be specified. The search command would simply request the nearest examples of the desired character to be located. A composite example of some of these capabilities might be an instruction to locate the nearest potash mine which is served by a main highway, north and south railroad connections, and is surrounded by a minimum of 10,000 sq. miles of good farmland.

The system can produce information in two different forms. The commonest form is perhaps the normal printed alphabetical and numerical data produced on the regular computer printer. In addition to the printer will be a graphic plotter which, under the control of the system, produces a map showing the location of the desired areas, lines, or points which satisfy the request.

An inherent danger of information systems is that the data entered into the system may vary widely in reliability, but

may be assumed to be equally reliable in subsequent multifactor assessments. The system can accept a reliability identifier with any type of information and can keep track of reliability tags so that degrees of reliability are printed out beside the answer to a request.

The advantages of information which is kept up to date, compared with data which have to accumulate for several years before it is economically desirable to reprint a map, are well known to users of map information. Data can easily be added to the system without waiting for large amounts of new data to accrue. Old coverage can be erased and replaced on the magnetic tapes or, if desired, both the old and the new coverage can be retained. New survey data at a more detailed scale can be incorporated with previous data at smaller scales, provided, of course, that the classification systems are compatible.

For many of the day-to-day information needs of administrators of land resource policy, simple forms exist to allow the administrator to initiate the request without the assistance of a computer programmer. Although more detailed assessments requiring the full flexibility and capability of the system would best be handled by someone acquainted with the data formats, a considerable amount of programming effort has been eliminated even at this level by use of programs already written and incorporated into the system. It is estimated that, with no previous computer knowledge, an administrator could be taught to complete normal form-originated requests in one week. Three weeks training and practice thereafter are expected to be necessary for the same administrator to handle more detailed requests. The unusual or very complex requests will need a programmer working in conjunction with the system librarian.

In many ways the system is self-monitoring. On accepting a request for information, the first response of the librarian will

be to use the system's KWIC* index to check whether that particular request has been made before and, if so, to indicate where the answer is stored in the filing cabinet. If the request has already been partially answered, this also is determined. If the request requires new manipulation of data, the system indicates which tapes have the requisite data stored on them.

The tapes then are selected from the library, put on to the computer and the assessment is executed. An extension of this capability is to provide a cost estimate of the work, prior to processing, based on a preliminary analysis of the amount of data on the requested tapes. Such estimates will be necessary in more complex applications.

The system is independent of peripheral devices such as input scanners or output plotters. While the IBM cartographic scanner is now in use, in conjunction with a D-Mac X-Y digitizer, to convert graphic data to digital form, instrumentation is likely to be developed in the next two or three years to combine these functions.

The normalization step, which converts digitized graphic information to the format required by the data bank, is independent of the main system functions and can be changed accordingly.

The system is designed for use on the IBM System 360 Model 50, with 512 thousand bytes** of storage, 6 magnetic tape drives, and 3 magnetic disc drives under the control of the standard operating system. Greater operating efficiency is achieved if the System 360 Model 65 is used. The practical application of the data bank concept and the entire system capability is available by use of this general-purpose computer.

*KWIC - Key Word In Context document indexing and cross-referencing system based on computer sorting of key words in the title. Ref. IBM Publ. E20-8091.

** Byte - a unit of computer storage space made up of eight digits, or bits, in the binary system (using only 0 or 1). Each byte is capable of storing one letter, two decimal digits, or a binary value.

SYSTEM DESCRIPTION

Boundary data to be put into the data bank are traced (scribed) on to a clean sheet from the source map (Fig. 1). The unique areas or 'map elements' are numbered on a transparent overlay and the corresponding classification is transcribed to a data sheet for punching into cards to be read by the computer.

The traced boundary sheet is placed on the drum scanner, and the scanning operation produces a digitized map of the boundaries on magnetic tape. The drum scanner was developed to meet Rural Development Branch requirements by the International Business Machines Company. The possible use of the drum scanning approach was first considered in 1963. The preliminary design criteria were established by the Rural Development Branch in 1964 and development work was contracted to the International Business Machines Company in 1965. The scanner consists of a cylindrical drum on which a map or chart can be mounted, and a movable carriage which slowly moves the scanning head across the front of the revolving drum. The scanning system consists of the scanning head proper, its associated electronics, and controls leading to a standard IBM magnetic tape drive.

The technique employed is to detect the changes in intensity of light reflected from black or white areas on the map or chart surface and to record this information as a series of binary bits written on magnetic tape. The scan head is a device utilizing fibre optics and is capable of scanning eight scan lines simultaneously. The drum scanner can accept a map up to 48 in. x 48 in. in size. A full-size map takes approximately 15 minutes to scan, including the time for mounting and dismounting it. Smaller sheets take a correspondingly shorter time.

It is not within the scope of this paper to give a detailed description of the drum scanner, though it is hoped that the engineering aspects will be covered in detail in a future paper. The format of the map-image data on tape is, however, pertinent to

the discussion. One map-image record is produced for each 0.032 in. along the X-axis of a map sheet, and the height of each record area is 0.004 in. along the Y-axis. The 0.032 in. record, comprising one byte of computer storage, is divided into eight bits. Each bit thus represents an area or spot 0.004 in. wide. Lines drawn on the map are usually 0.008 in. wide. If the scan heads on the scanner identify 50% or more of a spot as part of a line, then a '1' bit is generated; otherwise a '0' bit is generated. A line in this manner is represented as a collection of bits which are usually either one, two, or three spots in width.

The traced boundary sheet with the transparent numbered overlay is placed on a D-Mac cartographic X-Y digitizer where the four reference corner points and the co-ordinates of one reference point per 'map face' are coded in digits. A map face is any one of the distinct areas that together make up the surface of the map. As noted before, information related to a face is considered to be homogeneously distributed within that face. The output from the X-Y digitizer is produced on magnetic tape by means of an NCR encoder; this will revert to punched cards if it is found that the error-edit capability of cards is needed. The classification data sheet is now also directly transcribed on to magnetic tape, though this may be taken back to punched card output. Classification data and the digitized reference points are combined on the basis of map face number to result in a classification tape.

Entering Data into the System

The basic approach to feeding map data into the system is to reconstruct a line segment, or the part of a line that lies between adjacent vertices, from the points comprising the scanned map image. These segments are then combined with the classification information to produce map faces which are a basic unit of storage.

The following are some of the steps in this input procedure: As a preliminary, the identification of the scanner and classification tapes, coverage and map identification, and similar

data are put into the procedure which controls the flow in the subsequent update* operation. The classification tape is edited for data consistency and is changed into system format during this stage (Fig. 2).

The map-image tape then enters the main map-data reduction procedure. Since a 30-in. by 30-in. map generates over 56 million bits, occupying over 7 million bytes of computer storage on an IBM System/360, the data reduction of the map image is performed sequentially on smaller units known as 'sections'. The use of a square (or nearly square) section results in considerably longer lines being available from the map for processing at one time than would be the case if a long, thin rectangle were used. A computer with 512 thousand bytes of core storage can handle a section in the order of $1\frac{1}{2}$ in. x $2\frac{1}{4}$ in.

Each spot in the cloud of spots which make up the lines is assigned a 'V' value. This is a measure of the number of information-carrying spots surrounding it. This minimizes the effect of irrelevant bits and tends to pick out the center points along the line. The search follows the highest V values; it eliminates the redundant spots in the cloud.

The center points are coded to identify line intersections (or vertices) and the sense of direction of the line. Having thus located the points which comprise boundary lines, it is a simple task to record the X and Y co-ordinates of each point along a segment.

The system requires descriptive information to be related to map elements. One method of accomplishing this is to apply an identifying tag to both sides of the line. This tag also indicates

* Update - A computer procedure to combine new data being entered into the system with data already existing in the system. This may take the form of correcting, replacing, or deleting existing data, or inserting or adding new data.

in which direction the line was first followed, this being necessary if the sides of the line are to have a constant meaning. The identifying tags are called 'system colors'. They are analogous to the colors in a political map. A sort-and-search of these colors enables the segments to be connected with each other, and hence faces to be assembled.

Using the reference points in latitude and longitude taken from the four corner points of the map, a transformation is carried out which locates the X-Y digitizer map-element reference points within the scanner. Map projections, which can vary from one map to another, are normalized. Calculations are made to correct for linear distortion and skewed orientation of the map on the scanner or digitizer. The transformed 'map-image data set' and the classification (or 'descriptor-data set') then are matched and compacted. During this match-and-compact operation, the map-image co-ordinates are recorded in terms of a standardized geodetic co-ordinate system. This allows a uniform base for storage and the subsequent measurement and overlay procedures.

The choice of a standard co-ordinate system was a major consideration. The eventual measurement needs (i.e. area, length, and centroid) required the chosen system to be locally cartesian. However, a co-ordinate system based on a projection can result in a system of regions, each with its own co-ordinate system. This problem is particularly pertinent when one considers an area as extensive as Canada.

Careful investigation indicated that a system comprised of the geodetic latitude and longitude had many advantages. The smallest division in the geodetic co-ordinate system used in the data bank is called a unit grid. It represents an angular displacement of $1/2^{24}$ degrees. This was derived quite empirically. Using a 4-byte unit, 1 byte allows a span of 128 degrees which is sufficient to encompass Canada. The remaining 3 bytes represent the possible subdivision of any one degree.

The theoretical resolution of the system is determined by the actual distance on the ground covered by this unit grid, which at 45 degrees latitude is just over 1/4 in. in the latitudinal (or X) direction. This is considered adequate for the data being put into the system.

Scale within the system is in terms of the unit grid distance. Factors from 2^0 to 2^{31} have been devised to provide coarser resolution.

To handle map information within the system it is convenient to subdivide the co-ordinate system into regions called 'frames'. A frame has an equal angular displacement in the X and Y directions, hence is a square in the geodetic co-ordinate system.

A relatively simple calculation reveals that a map of average density (30 in. by 30 in., with 800 in. of boundary lines), will occupy 200,000 bytes of storage if no scale change or transformation is performed. With up to 30,000 maps envisaged as the primary content of the data bank, a compact notation for storage of co-ordinates was essential.

With a code based on direction change between co-ordinates and distance between co-ordinates, a sequence of simple codes can be used to describe co-ordinates. A sample line, requiring 864 bits for normal X-Y recording, occupies 76 bits in compact notation. If required, lines with regular patterns can be further compacted by storing the pattern with an indication of how many times the pattern is repeated.

In the match-and-compact phase, routines are carried out to calculate the area of each face, the centroid of face elements, and the length of line elements. In the same phase, an extensive error analysis is performed to ensure that the map is topologically correct. Errors found at this stage are documented by a series of error messages on the computer printer.

The match-and-compact operation produces two index files.

The first of these is a face file with classification and frame number which, when sorted, is used in updating the descriptor-data set. The second is a face file with segment identifiers which is used to update the image-data set. Incorporated in the second file is the basic compact notation of co-ordinate data by frame number. The routine for updating the image data set provides the geodetic properties (area, centroid, and length) as required to update the descriptor-data set. Both of these update routines can produce error listings as new data are matched with data already in the data bank. Again, error correcting is carried out as an update to the primary map-data reduction phase.

The best approach to take with regard to error correction will only be found by trial with a working system. Given a high percentage of errors requiring reference back to source documents or even to field survey, the relatively expensive method using cathode-ray tube displays would add little, if anything, to the efficiency of the error-correction procedure. On the other hand, given a high percentage of errors of a strictly cartographic nature and not requiring reference to source documents, the cathode-ray tube approach, by which images displayed on the tube can be corrected by 'drawing' on it with a beam of light, would have considerable merit. Both approaches will be investigated during the system trials.

Data Bank Organization

The data bank is divided into classification data contained within the descriptor-data set and boundary data contained within the image-data set. Three levels of file organization are envisaged. These are: (1) consecutive, (2) regional, and (3) indexed. These file organizations, together with an unstructured or structured version of the classification data within the descriptor-data set, have been combined into six levels. Five of these will be possible within the present scope of the data bank.

Using the descriptor-data set as an example, the relationship between the various levels can be thought of as follows:

Level 1 represents the basic descriptor-data set arranged by consecutive face number; Level 2 represents a sorted Level 1, grouped according to some selected characteristic or set of characteristics; Level 3 is the equivalent to Level 1 for a specific region or group of regions; Level 4 can be thought of as a Level 3 which has been structured by grouping the faces relating to a certain characteristic or set of characteristics; Level 6 is a Level 2 or 4 which is not only structured but has an index of its contents available to facilitate further search. Level 5 is not implemented as an indexed consecutive file is not an advantage.

In the descriptor-data set for each map element, there is a list of pointers to the frames containing relevant parts of the boundary information for that map element. The format of this key varies with the level of file organization, but in all cases, it serves to relate the image-data set to the descriptor-data set. The record formats of the various levels of descriptor-data set are illustrated below.

Level 1, 3

Record Type	Coverage Number	Map Element	Geodetic Data	Factor Data	Frame List	Level 3 Region List
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Level 2, 4, 6

Record Type	DDS Key	Geodetic Data	Non-Key Factor Data	Frame List	Region No. List
	Classification Data				

Data Retrieval

As the boundary information is kept separate from the description information it is only necessary to use the boundary information if actual boundaries have to be compared or output. Otherwise, all retrieval can be done from the description information files. This leads to extremely efficient use of the data bank, as most requests will not require use of the boundaries.

A computer needs a detailed description of the location and organization of data within itself before it can bring it out or manipulate it. These detailed descriptions are themselves kept in computer storage and are indexed by key words. These key words have been made to be the normal words that would ordinarily describe the maps such as PRESENT LAND USE or AGRICULTURAL CAPABILITY. The use of such key words automatically generates computer programs that both describe the data and actually bring it out of the computer.

In the same way key words are used to describe the types of manipulation that can be carried out by the system. When data is to be retrieved the request is written by combining the key names of the data and the key words of the desired analysis. This results in a very powerful set of instructions being available that are also very flexible. This flexibility in data specification statements is made possible by use of the PL/I language. Uncomplicated requests will be extremely simple to address to the computer. The more complex requests will necessitate a small program being written, but even this will be facilitated by the use of these key words which represent already written small programs.

Overlay Procedure

The overlay procedure of the system is the well-known function of putting one map over another and examining the resulting data relationships.

Firstly, the two maps in the data bank are brought to the

same scale. Then a section of one map of a size that can be handled by the computer is brought into core and the corresponding section of the map being overlaid is similarly brought into core and superimposed on the first. This, in effect, creates a new map with new faces. The new faces are 're-coloured' and identified as new homogeneous areas. The first description data set is then brought in and the proper description is applied to each of the new faces. The description data set from the overlay map is similarly brought in and applied to the new map faces. Each of the new faces has now got a double name, one from each of the original two maps. The process is thus one of creating one 'new' map from the two original maps being overlaid. The new map can then have its areas measured and summarized in the same way as any other map in the system. It is stored and kept in the system as if it were an original map coverage. Up to eight maps can be overlaid in the same operation but obviously this is not a limitation, as the results of two overlays can subsequently be themselves overlaid.

Data Control

Data control within the system is achieved by the system monitor. The system monitor accepts pertinent data on the history of map-data manipulation within the system at all times. Many of the responsibilities for system control in such an open-ended system must rest with the system librarian.

The librarian's responsibilities include deciding whether coverages are permanent or temporary, selecting the resolution at which boundary lines for various coverages need to be stored, and deciding the way in which the descriptor-data sets are filed for ease of retrieval and comparison. He is also responsible for providing the procedures which edit the classification data in the preliminary phase of the map-data reduction sub-system. He must tailor the key words that describe the different types of map and different types of manipulation to efficient, specifically applicable retrieval requirements. He is in control of the flow of

individual maps within the system and, similarly he must evaluate the practicability of assessment requests, including the avoidance of duplicate assessments.

CONCLUSION

The Geographic Information System of the Rural Development Branch is still in an early stage of its development. Not all the procedures described have yet been fully implemented and at present rates of progress it will be several years before the data bank contains maps for any one type of information that cover the whole of the settled portion of Canada. The effectiveness of the system will of course depend as much on the quality of the data entered into the bank as on the capabilities for handling data. Nevertheless, the system is further advanced than any other major land data bank and contains several new concepts and techniques, especially those relating to the compact storage of boundary data and the rapid comparison of one map with another. Such a system is essential to effective rural planning in any country and offers for the first time the possibility of rapid and efficient geographical analysis which has application in any nation where the developing economy is concerned with the natural resources.

LEGENDS TO FIGURES

Fig. 1. Diagram showing flow of data preparation procedures.

Fig. 2. Diagram showing sequence of file update operations.



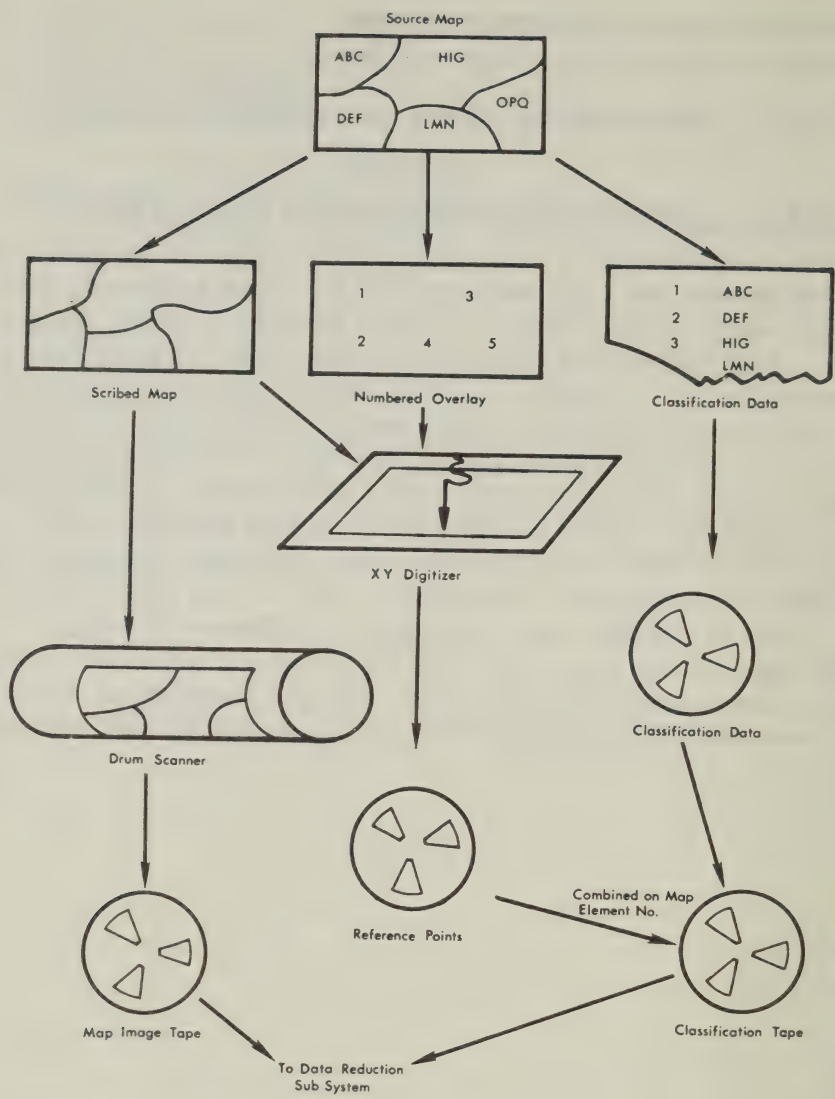
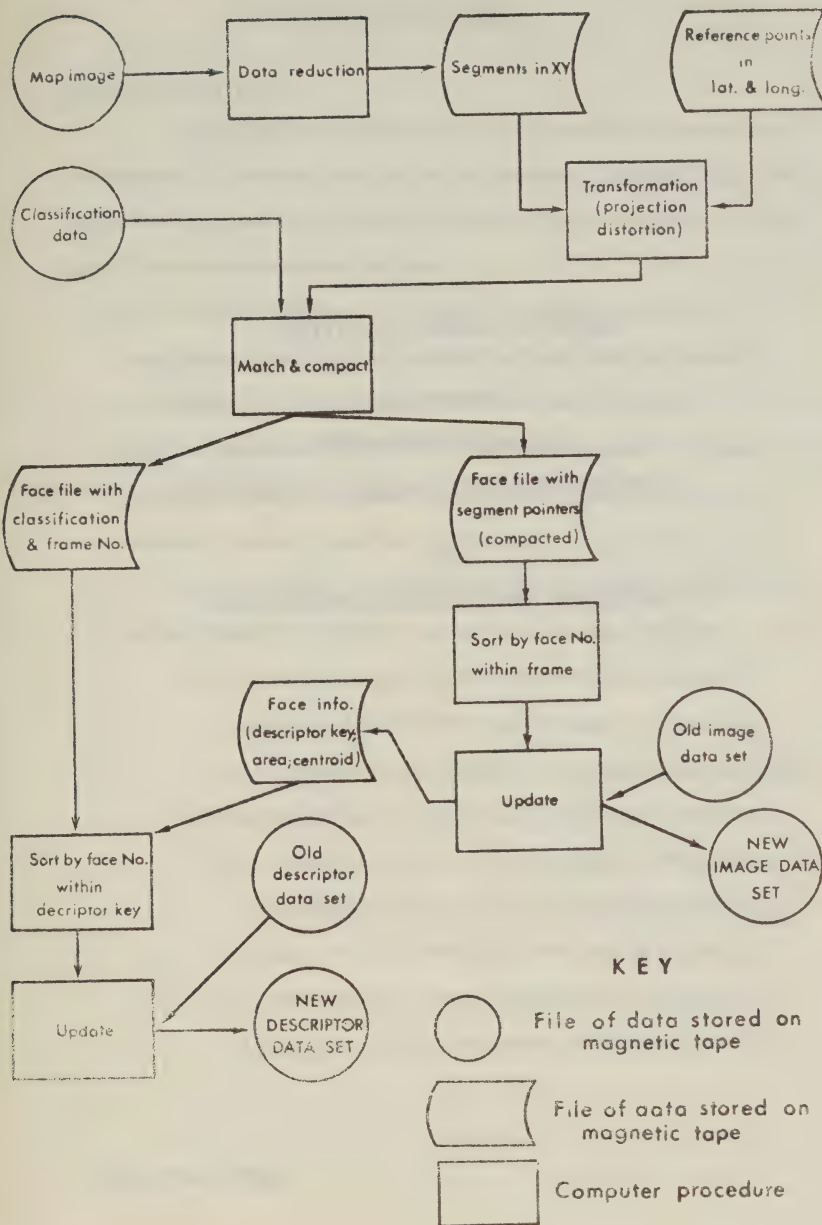


FIG. 1
DIAGRAM SHOWING FLOW OF DATA PREPARATION PROCEDURES

Fig. 2 Diagram showing sequence of file update operations.



REPORT ON SCIENTIFIC ACTIVITIES

Prepared by

AREA DEVELOPMENT AGENCY

DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

for

THE SENATE COMMITTEE ON SCIENTIFIC POLICY

Dated March, 1969

SCIENTIFIC RESEARCH ACTIVITIES
as carried out by the
AREA DEVELOPMENT AGENCY

Authority or Mandate

The Area Development Agency was established under the Department of Industry Act, which was assented to 22nd July, 1963. Under Part II, sections 9 and 10 of the Act, the purposes of the Agency were referenced as follows:

"9. The Governor in Council may designate as a designated area for the purposes of this Act any district or locality in Canada that is determined to require special measures to permit economic development or industrial adjustment by reason of the exceptional nature or degree of unemployment in that area.

"10. The powers and duties of the Minister in relation to the Agency referred to in section 12 shall include

- (a) the undertaking of research and the making of investigations respecting the means of increasing employment and income in designated areas; and
- (b) the preparing and carrying out of such programs and projects to improve the economic development of designated areas as may be appropriate to the purposes of this Part and that cannot suitably be undertaken by other departments or branches or agencies of the Government of Canada."

Relevance and Importance of Research
Activities to the Program

The Area Development Agency establishment is comprised of a Commissioner, Deputy Commissioner, an Incentives Division, a Regional Development Division, and Specialist staff. The Specialist staff perform the functions of program co-ordination and assume the responsibility of carrying out research activities for the Agency. The Specialist staff consists of eight positions out of a total of 60 positions (officer and support staff). This approximates 12% of the staff resources that are directly or indirectly concerned with research activities. Approximately 60% of the time of the Specialist staff is directly concerned with research activities, the remaining portion of time is directed towards service and administrative functions.

Functionally, the research activities provide the analytical basis for the identification of "designated areas" and thereby establishes the geographic parameters in which the industrial incentives and regional development programs are administered.

Objectives and General Orientation
of Research Activities

The objectives of research activities are closely related to the objectives of the overall program and are concerned with the assessment of economic conditions on an area and regional basis, the means of improving these conditions and research directed towards evaluating the industrial incentive program. The principal sectors of research are as follows:

- 1) The analysis of economic conditions on an area and regional basis, the study of community problems and research concerning delimitation of development regions.

- 2) Research to appraise the types of industrial incentives and other types of incentives for development purposes.
- 3) Applied research relating to the feasibility of locating specific enterprises in given localities.
- 4) Research evaluating the ADA program with reference to its impact on the economic and employment growth in designated areas.

Internal Structure

As of February 1969 the number of research personnel consisted of four officers and four support staff. The academic training and labour market experience of the officers are summarized as follows:

<u>Birthplace of Officer</u>	<u>Last University Degree Obtained</u>	<u>Number of Years with Agency</u>	<u>Number of Years on Labour Market (excluding University Enrollment)</u>
Canada	M.A. - Canada	3	15
Canada	M.A. - Canada	1	9
Canada	M.B.A.- Canada	1	4
England	Ph.D. - England	Less than 1	17

The average age of the above officers is 36. All members have ability to work in English and one member has ability to work in French. The support staff consists of two stenographers and two clerks.

Research within the Agency (inhouse research) has been restricted in the main to the analysis of data internal to the Agency and to data received on a confidential basis from other departments. Because of the relatively small staff associated

Special Committee

with research activities, considerable reliance has been placed upon satisfying the Agency's research requirements through the use of contracts let with universities and private consultants.

Summary of Projects 1963-1968Inhouse Research

Since the commencement of the ADA program in July 1963 no published research projects have been produced within the Agency. Numerous projects have been undertaken and completed for purposes of program support and that have served to complement studies contracted by the Agency to universities or private consultants. Examples of research carried out inhouse are as follows:

- labour force projections and the analysis of labour force and job vacancy ratios in Cape Breton Island.
- Analysis of factors, including industrial incentives, underlying the decision making processes of entrepreneurs in their selection of new manufacturing plant sites.
- Analysis of the efficiency of different types of industrial incentives for purposes of area development.
- Analysis of levels of income and income distribution in designated areas.
- Analysis of industrial patterns emerging under the Program's incentive scheme.

The staff salaries allocated on the basis of association with direct research activities approximate \$35,000 per annum. It is estimated that of this sum \$20,000 is apportioned to inhouse research and \$15,000 relates to activities concerned with research let out under contract.

Contract Research

As of February 1967 ten research projects have been completed and reports have been presented to the Agency. These reports have been made available to the public. In addition to the above, three studies are scheduled for completion by April 1969. The cost of the total complement of studies is \$224,950. Some of the studies have been contracted for periods greater than one year. The amount of funds spent on contracted research allocated on an annual basis has been approximated as follows:

1964-65	\$ 2,000
1965-66	21,000
1966-67	55,950
1967-68	73,000
1968-69	<u>73,000</u>
	\$ 224,950

The following studies have been completed with reports presented to the Agency:

- "The Cape Breton Island Tourist Industry, 1964", by
C.W. Raymond, Memorial University, St. John's, Newfoundland.
- The study analyzes the growth of Cape Breton Island's tourist industry since 1959, taking into account the reconstruction of the Fortress of Louisbourg, and making observations with respect to the current and future tourist development of the area. Completed in 1965. Cost - \$2,000.

Special Committee

"A Study of the Problems of Certain Cape Breton Communities", by K. Scott Wood and H.F. Varge, Institute of Public Affairs, Dalhousie University.

- The study evaluates problems of adjustment being faced by communities in Cape Breton which are dependent on a narrow and declining economic base. Completed 1966. Cost - \$10,000.

"Physical Location of Industry in Canada", by G.M. Davidson, Consultant in Town Planning.

- A study analyzing the physical facilities of area environment on industrial location. Completed 1966. Cost - \$9,500.

"Area Development Policy in the United States 1955-1965", by M.J. Boote, Professor of Economics, Trent University.

- The study examines American experience in the development of economic policy in relation to depressed areas during the ten-year period 1955 to 1965. Completed in 1966. Agency contribution - \$1,500.

"Industrial Land Study, Corner Brook, Newfoundland", by Project Planning Associates, Toronto. The study assesses the physical environs of Corner Brook for industrial development, including availability of land, land prices, and proposes a physical development plan. Completed 1967. Cost - \$15,500.

"The Post War Development of Nova Scotia Manufacturing Industry", by R.E. George, Professor of Economics, Dalhousie University.

- The study examines the costs involved in alternative manufacturing locations between Nova Scotia and Central Canada. Completed 1967. Cost \$2,850.

"Research Needs in New Brunswick". A study undertaken by New Brunswick Research and Productivity Council.

- The study evaluates present and future research requirements in New Brunswick within the categories of economic research and technical research relative to the New Brunswick economy. Completed 1967. Cost - \$20,000.

"Delimitation of Development Regions in Canada" by R.S. Thoman and M.H. Yeates, Department of Geography, Queen's University.

- The study formulates criteria and principles generally applicable to the delimitation of development regions in Canada, and sets forth a delimitation of a development region in the Georgian Bay area of Ontario. Completed 1967. Cost - \$17,600.

"A Study of the Impact of the Area Development Program on the Southern Georgian Bay Area, Ontario", by M.H. Yeates and P.E. Lloyd, Department of Geography, Queen's University.

- The study assesses primary and secondary economic impacts of the ADA program to the focal point of designated areas and sets out local, regional and national employment multipliers in regard to the ADA induced industries. The implications for sustained industrial development in the area are examined as well as the economic strains put upon communities resulting from a rapid influx of industrial capital. Completed 1968. Cost \$41,000.

Special Committee

"Industrial Development Assessment of the Moncton Area, New Brunswick", R.B. Truemner, Regional Planning Consultant.

- The study examines factors limiting industrial development within the community and assesses the potential for future industrial development, including location site factors, state of commercial development, transportation and distribution facilities, and the state of community awareness and preference for industrial development. Completed 1969. Cost - \$15,000.

Studies in Process

"Impact of the ADA Program on Newfoundland" under direction of N. Hurwitz and Y. Cho, Department of Economics, Memorial University. Estimated Cost - \$30,000.

"Impact of the ADA Program in Nova Scotia", under direction of R. Comeau, Department of Economics, Dalhousie University, estimated cost - \$30,000.

"Impact of the ADA Program in New Brunswick", under direction of H. Larsen, Department of Economics, University of New Brunswick, estimated cost - \$30,000.

The above are projects undertaken in 1967 and scheduled for completion during the fiscal year 1968-69. The studies will complement one another and supplement information obtained in the earlier study of the Georgian Bay.

PUBLICATIONS AND THESIS TITLES

by

RESEARCH STAFF

- A) G. Ala
- B) P. Bowden
- C) E. King
- D) J. Martin

L. G. Ala

Thesis Titles

- 1) Ladner, British Columbia: A Case Study in Planning for the Revitalization of the Commercial District in an Established Hitherto Rural Community Subjected to Expanding Metropolitan Growth,
(Master's Thesis in Community and Regional Planning,
Department of Community and Regional Planning,
University of British Columbia, 1961).

Significant Publications

- 1) Urban Renewal: Ottawa, Canada,
Corporation of the City of Ottawa, March 1969.
- 2) Industrial Land Study,
City of Ottawa, 1967.
- 3) Lower Town East Neighbourhood Study,
City of Ottawa, 1966.
- 4) Preston Street Neighbourhood Study,
City of Ottawa, 1965.
- 5) A Development Plan for Shellbrook, Saskatchewan,
Department of Municipal Affairs, Regina, Sask., 1963.
- 6) A Development Plan for Outlook, Saskatchewan,
Department of Municipal Affairs, Regina, Sask., 1963
- 7) A Development Plan for Humboldt, Saskatchewan,
Department of Municipal Affairs, Regina, Sask., 1962.

P. Bowden

Thesis Titles

- 1) The Effects of the Trade Cycle on Human Fertility.
(B.A. dissertation), 1949.
- 2) The Internal Wood Trade in England (Ph.D. Thesis) 1952

Significant Publications

- 1) The Capital Requirements of New Industrial Establishments in the North-East of England.
- 2) An Economic and Sociological Study of the New Town of Newton Aycliffe, Co. Durham.
- 3) Economic Growth in the North-East of England
- 4) Industrial Retraining in the North-East of England
- 5) 'Movements in Wool Prices, 1490-1610', Yorkshire Bulletin of Economic and Social Research, 1952.
- 6) Northern Region: Review of Industry and Employment in the North-East of England (North East Industrial & Development Association), 1954.
- 7) Northern Region: Review of Industry and Employment in the North-East of England (N.E.I.D.A.) 1956: in association with A. J. Odber.
- 8) 'Wool Supply and the Wool Textile Industry', Economic History Review, 1956.
- 9) 'The Home Market in Wool, 1500-1700' Yorkshire Bulletin of Economic and Social Research, 1956.
- 10) Development Area Policy in the North East of England, (N.E.I.D.A.), 1957: in association with E. Allen and A. J. Odber.

- 11) 'Movements in Wool Prices - A Reply' Yorks. Bull. Econ. & Soc. Res., 1957.
- 12) 'Rent Subsidies in Development Areas' Journal of Industrial Economics, 1958: in association with A. J. Odber.
- 13) 'The Regulation of the Internal Wool Trade, 1552-1624', Wool Knowledge, 1957-58.
- 14) The Wool Trade in Tudor and Stuart England (Macmillan) 1962. Republished 1968.
- 15) 'Industrial Employment in the New Northern Region', Stock Exchange Gazette, 30th July, 1965.
- 16) 'Regional Problems and Policies in the North-East of England', Papers on Regional Development, ed. Thomas Wilson, 1965.
- 17) 'Sheep Breeds', Agricultural History Review, 1965.
- 18) 'Attracting the Executive', Financial Times, London, 9th May, 1966.
- 19) 'Agricultural Prices, Farm Profits and Rents', a 160 page contribution to The Agrarian History of England and Wales, Vol. IV. (Cambridge University Press), 1967.

E.E.R. King

Thesis Titles

- 1) Changes in Farm Occupancy,
(B.S.A. - University of Saskatchewan)
- 2) Interregional Competition in the Western
Canadian Market for Eight Fresh Vegetables,
(M.A. - Economics, University of Alberta)

Publications

- 1) The Market for Eight Fresh Vegetables
in Western Canada, Ottawa, June, 1962.
- 2) "The Potato Industry in Alberta",
Economic Analyst, Ottawa, 1963.
- 3) "Capital Investment, Production Costs and
Yields of Commercial Potato Production",
Economic Analyst, Ottawa, 1964.
- 4) "Decreasing Farm Numbers and Incomes",
Canadian Farm Economics, Ottawa, April, 1966.

J. Martin

Thesis Titles

Le concept de pôle de croissance, appliqué
à la ville de Sherbrooke

(L. Sc. Com., Université de Montréal)

REPORT TO
SENATE SPECIAL COMMITTEE ON SCIENCE POLICY
ON THE
CANADA NEWSTART PROGRAM

MARCH 1969

CANADA
PRIVY COUNCIL

P.C. 1966-16/2057

(T.B. REC. 660891)

AT THE GOVERNMENT HOUSE AT OTTAWA
THURSDAY, the 3rd day of NOVEMBER, 1966

PRESENT:

HIS EXCELLENCY

THE GOVERNOR GENERAL IN COUNCIL.

His Excellency the Governor General in Council, upon the recommendation of the Minister of Manpower and Immigration and the Treasury Board, pursuant to section 2(f) of the Appropriation Act No. 7, 1966, and Vote 15(a) of The Supplementary Estimates "A" for the fiscal year ending the 31st day of March 1967, is pleased hereby to approve agreements substantially in the form attached hereto with the Provinces of Alberta and Prince Edward Island which the Minister of Manpower and Immigration will enter into on behalf of Canada for the establishment of Pilot Training Projects in connection with the utilization of manpower resources in Canada, including the development of experimental training methods and techniques, the payment of training allowances and related activities.

CERTIFIED TO BE A TRUE COPY - COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL - LE GREFFIER DU CONSEIL PRIVÉ

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PURPOSE AND IMPORTANCE

The NewStart Program is intended for areas of Canada having an unusually high proportion of people inexperienced in work that will yield anything close to the average Canadian standard of living.

The purpose of the program is to help the disadvantaged to acquire the motivation and preparation necessary for stable and rewarding employment.

The program will operate only in selected small areas, up to a maximum of ten. In these selected areas, NewStart corporations will be established by agreement with the provinces. The corporations are responsible for conducting experimental projects designed to help disadvantaged adults to acquire the motivation and preparation necessary for employment.

The experimental projects are so conducted that the provinces and the federal government can take advantage of their findings in structuring development measures for other areas.

The corporations in the field and the headquarters staff at Ottawa work closely with federal departments and provincial governments. They pass to the appropriate departments of government all findings that may be significant for policy and programs.

OBJECTIVE

The Canada NewStart Program is one experimental approach to solving the development problems of particularly disadvantaged areas. Its objective is to develop, through action research, methods and programs which will prove their effectiveness in helping to motivate and prepare unemployed and underemployed adults to take advantage of opportunities for stable and rewarding employment.

The program operates in selected small areas. It is hoped by this means to find techniques which are applicable to development programs in other areas.

The program is conducted by NewStart corporations. They involve numerous individuals, agencies and other resources in all phases of the experimental human and social development program.

A NewStart project is an experimental and demonstration activity which is undertaken to:

1. Develop sufficient acquaintance with a problem area to permit the formulation of hypotheses for testing by experimentation.
2. Pioneer program innovations.
3. Display and demonstrate the feasibility of using new ideas, techniques and programs which are not yet in general use; with the

intent of stimulating and assisting in the widespread adoption of those that are considered successful.

4. Develop new knowledge or use existing knowledge in new applications to activities which are or may be organized to meet problems of motivating and preparing disadvantaged adults for stable and rewarding employment.

These projects study, in a real life context, ways and means of alleviating problems through systematic experimentation with new or modified techniques and institutional arrangements.

TERMS OF REFERENCE

The terms of reference agreed upon by the federal and provincial governments give the NewStart corporations the powers to:

1. Develop methods of qualifying persons who are disadvantaged, for rewarding and stable employment.
2. Execute on an experimental basis approaches to the solutions of employment problems by recruitment, motivation, counselling, basic education, training, placement, welfare and related matters; on the basis of the employment and other prospects for persons with various levels and types of education and skills.
3. Carry on the activities of a research centre, pay and provide such other services and benefits as are deemed necessary, to or on behalf of trainees.
4. Maintain liaison with local and regional human and social development agencies and with provincial and federal governments and agencies.

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5. Develop methods of evaluating the procedures and methods used, prepare reports and publish and disseminate information relating to research and related programs.
6. Enter into any arrangements with any authorities, public, academic, private or otherwise that may seem conducive to the Corporation's objects or any of them, and to obtain from any such authority any rights, privileges and concessions which the Corporation may think it desirable to obtain, and to carry out, exercise and comply with any such arrangements, rights, privileges and concessions.

The needs of a designated area include not only preparation for unfilled jobs, but also the creation of a milieu which encourages, provides for and assists with the total preparation of the labour force potential in an area. A designated area presents particular challenges in this regard, because of its characteristic low level of education, aspiration and opportunity. Therefore, the Canada NewStart Program must address the total situation of the community regarding employment preparation and work. This requires a broad range of programs and methods. A comprehensive approach to an area's human and social

problems will reveal more clearly the gaps and overlaps in programs. The areas will be used as laboratories to validate a wide range of possible techniques and programs for human resource and social development.

MAIN AREAS OF RESEARCH

(See Terms of Reference)

GENERAL METHODOLOGY

Design of the Action Research SystemA. Criteria

The Canada NewStart Program is experimental in nature, and the evaluation and the cost/benefit analysis of each phase is critical to the whole operation. On the basis of such assessments it will be possible to determine the value of the methods and techniques developed, and most importantly assess the extent to which they can be replicated economically on a wider basis.

An experimental project must have measurable criteria to assess the extent to which its objectives are achieved. In educational, social and economic experimental programs there is a requirement for both intermediate and ultimate criteria. The ultimate criteria are related to the social and economic intent of the program.

Regular evaluation of the program is essential to learn how the various segments of the program are meeting the goals set for them, to identify new and changing problems which may require program adjustment, and to ensure that the policy and operation of the program are responsive to overall needs.

B. The Integrated Elements of the Action Research System

The application of modern system theory to the Canada NewStart Program takes advantage of research, application studies, feasibility studies, job analysis, task analysis, behavioural analysis, and many other techniques. It relies upon analytical methods for establishing objectives, and calls for combinations of instructional media to meet the stated objectives.

1. Design of Action Research Systems

Heretofore, action research has had a minimal impact on social policy and programs because adequately conceived efforts have rarely been undertaken and completed.

The complexity of the problems confronting the Canada NewStart Program requires the development of new action research designs so that any impact of changes of program variables on employability or on employment may be detected, identified and measured. This phase will also involve the development of a theory which logically interrelates a set of principles and procedures with the project objectives.

2. Development of Experimental Methods

The processes which will be experimented with to produce changes in employability and employment behaviour which might be fostered may also require changes in income maintenance, health service, business organization and practice, and social organization to support and

maintain these changes. Recognizing that community involvement is an integral part of development programs, individual community leaders and community agencies will be involved throughout the program and a measure of their effect will be attempted. Each program component must be well defined and described so that it may be used elsewhere if found effective.

3. Development of Evaluation Methods

Methods of evaluation are required to assess each component not only "before and after", but also during the experiment to suggest possible changes or improvements. They are required to identify inputs from several sources in the program or in the community, and to recognize which should be applied in other programs.

4. Development of Administrative Support

The establishment of NewStart corporations requires that these new, relatively autonomous organizations develop their own administrative services, including finance and accounting, personnel, purchasing, accommodation and equipment. Some of these, such as personnel (use of indigenous leaders, staff qualifications, staff-trainee ratios, etc.) and accommodation (location, type, etc.) may well also serve as experimental variables. Others (e.g. accounting) will provide evaluation data for cost/benefit analysis.

5. Planning, Conduct and Evaluation of Experimentation

The effectiveness of the projects will depend upon how well their objectives are defined and how program activities are planned and conducted. Methods of program planning, implementation and evaluation by a NewStart corporation will be based upon an analysis of the people and the community. Its problems and opportunities will suggest methods and a sequence of program activities. In experimental or intervention research this phase is critical because of the impossibility of reproducing any one experiment.

6. Applications for Implementation on a Widespread Basis

The purpose of the Canada NewStart Program is to develop methods which may be implemented on a widespread basis. This involves adapting and utilizing the results of experiments to prepare and demonstrate practical methods which are capable of general application.

The End-Product of the Program

The concept of objectives or end-product should be the focus of the values and goals of the program. This implies that something specific is to be delivered, and is to be applicable on a widespread basis following a sequence of experimental activities. This end-product will be tested and validated knowledge, usually in the form of reports which will provide the bases for widespread application of this knowledge.

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The reports of NewStart corporations will focus on the following five major areas:

1. Report of the project dynamics and its history, as well as significant insights, audits of the services rendered, and case histories.
2. The model and specifications for dealing with a given type of problem, making explicit all the essential services and procedures. This should be technical, to enable a new technology of human resource development for disadvantaged and inexperienced people to be replicated and applied successfully by others to the solution of the type of problem for which it was found to be valid.
3. An experimental analysis which uses experimental methodology (design, mensuration, etc.) to establish credibility in the judgements of effectiveness and in the empirically tested hypotheses pertinent to the acceptance of a scientifically developed artifact and/or behaviour system.
4. Ancillary studies and the data bank functions as a class of end-products should

be given prime attention. The NewStart corporations are sites for the analysis and study of human adjustment, social dynamics and behaviour systems basic to the development of slow-growth areas. Undoubtedly an analyst will find each project so complex that it provides more studies than he can conceivably handle. There are special problems in this area, but the potential return in terms of applied and basic knowledge is well worth the cost and effort.

5. Cost/benefit analyses in varied forms should, when possible, be a part of the project yield.

The transmission of the results of the program will undoubtedly commence before the termination of the program, and it is envisaged that the publication of reports and the conduct of symposia, demonstrations and conferences on new methods will be held as these new methods are developed and validated. In this way, the results of the program will be provided to the authorities concerned, so that they may consider and apply the new methodologies in a progressive manner.

STRUCTURE

Organization and Financing of NewStart Corporations

The unique organizational model developed for the Canada NewStart Program represents an exciting experiment itself.

Each NewStart corporation has considerable administrative authority and autonomy to ensure that:

1. Operating decisions may be made and implemented quickly.
2. Staffing problems may be handled promptly.
3. Freedom to hire and evaluate staff.
4. Flexibility be exercised, with freedom from rigid commitment to established methods and procedures of counselling, training etc.

The organizational structure considered best able to provide these operating conditions and to provide for financial accountability to the federal and provincial governments is that of a company or society formed in a province under provincial legislation. The federal and provincial governments hold equal shares in it. The board of directors of each corporation so formed consists of five members including the full-time executive director, and are appointed after consultation and agreement between

the federal and provincial ministers concerned. It is responsible for the operation of the corporation. The executive director is the chief executive officer. The records of the corporation are subject to audit by the government of Canada. The federal government finances up to 100% of the corporation's operation, and its assets will be turned over to the government of Canada at the termination of the project.

Each province which desires to participate will recommend the areas for one NewStart program and will state the particular problems or that part of the province.

The provincial minister concerned and federal minister responsible for regional development enter into formal agreement to incorporate the project, following joint agreement to the proposal. The agreement stipulates the terms of reference for the NewStart corporation, the personnel of the initial board of directors, including the executive director, responsibility for the costs of incorporation, the distribution of shares, and the conditions governing the winding up of the company.

On the basis of the agreement, an application is made to the provincial authorities for a company charter under provincial legislation.

After the granting of a provincial charter to the NewStart corporation, and appointment of the board of directors, the federal government will make an advance payment of up to \$150,000, under a contract with the

corporation, to enable it to prepare a plan of operations for consideration by the federal and provincial ministers. The plan will indicate the population of the area to be served, the nature of the tasks of employment preparation that are to be studied, the experimental methods proposed, and the liaison with provincial and federal government departments and agencies. The plan will include a budget and staff establishment.

Upon agreement between the ministers and the corporation to the plan, the federal Minister responsible for regional development will provide the required funds to the corporation. Subsequently, annual plans and budgets will be submitted to the provincial and federal governments. Each NewStart corporation will plan, organize, conduct and evaluate methods and programs required to meet the objectives in an area. It will co-operate with and utilize existing personnel and institutional resources.

The preparation and testing of new methods in new settings requires close and continuing collaboration between the individual NewStart corporations and the federal Department. This relationship must be free from administrative constraints, traditional methodologies and professional vested interests to ensure the interchange of critical ideas and findings, and the constant evaluation of the program.

A NewStart corporation addresses itself to the human and social development needs of an area, and is responsible for organizing and carrying out all aspects of the program. The staff for each corporation should be recruited to the extent possible from the area, because a significant dimension of the experimental project is to test the feasibility of this strategy.

A core staff is employed by each corporation to plan, promote, organize, supervise and evaluate the program in the area. The existence of such qualified staffs makes possible the necessary degree of autonomy and the ability to develop the program.

Selection of Areas for NewStart Projects

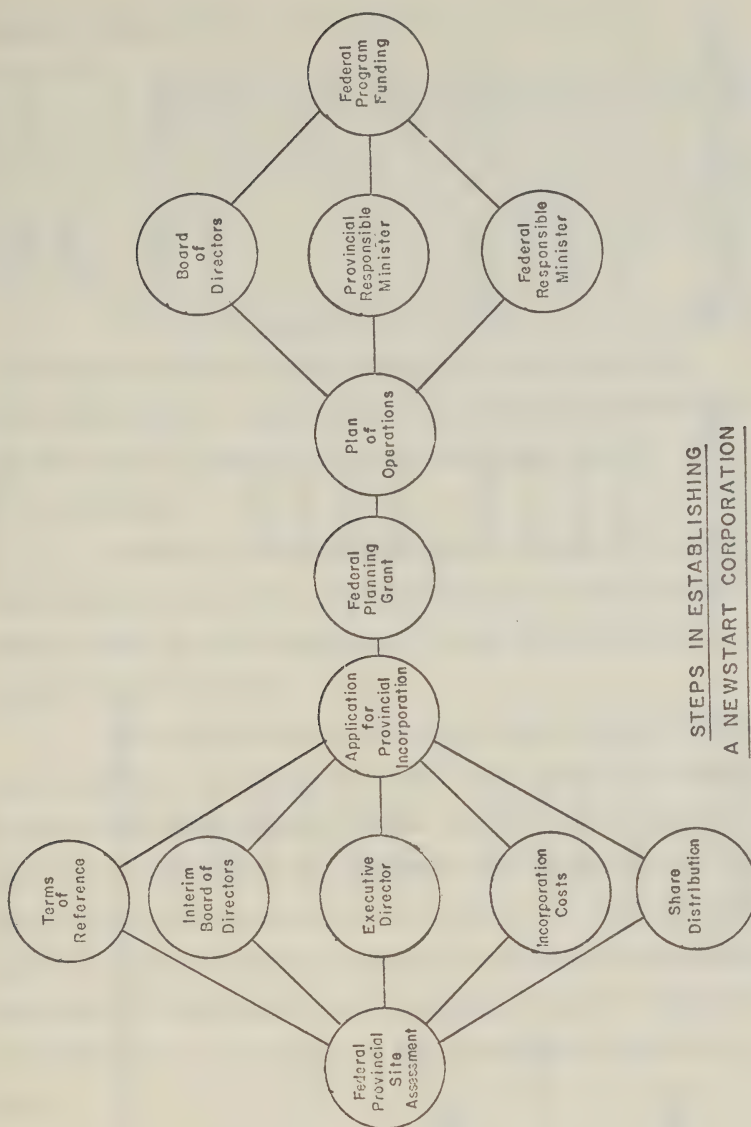
The locations for the NewStart projects are selected on the basis of discussion between federal and provincial authorities and must be in an area designated for development purposes.

The areas selected reflect a variety of situations including industrial growth or decline, sizeable native populations, various "mixes" of farm and non-farm populations etc.

These human and social development projects are established to develop the best methods of meeting the needs of disadvantaged, unemployed and underemployed adults.

Priority must therefore be given to those areas which have a maximum potential for intensive study of these problems. The NewStart corporation does not replace existing operational programs for training unemployed or underemployed groups in the area.

The areas are of such size as to provide scope for a full range of research and development activities, but not so large as to be unmanageable in terms of the development of experimental programs. A total population from 10,000 to 25,000 appears to be practical for this purpose.



STEPS IN ESTABLISHING
A NEWSTART CORPORATION

BUDGET

Payments to NewStart Corporations

	(a) Made	(b) Planned	(a) Approved Maximum Grant - 1968 Budget	(a) Paid prior to March 31, 1968	(b) Balance to be paid prior to 31 March, 1969
<u>Operating Grants</u>					
Alberta	1,169,822			950,000	219,822
Nova Scotia	858,100			800,000	58,100
Prince Edward Island	850,191			800,000	50,191
Saskatchewan	785,403			440,000	<u>345,403</u>
					673,516
<u>Planning Grants</u>					
Alberta	100,000			100,000	
Nova Scotia	100,000			100,000	
Prince Edward Island	100,000			100,000	
Saskatchewan	100,000			100,000	
New Brunswick	150,000				150,000
Manitoba	150,000				<u>150,000</u>
					300,000
<u>Available for initial payments on 1969 budgets</u>					
Alberta					500,000
Nova Scotia					<u>376,484</u>
					876,484
				3,390,000	1,850,000
<u>Experimental Projects Branch expenditures (excluding grants)</u>					
Fiscal year ending 31 March, 1968					\$327,811.00

PROGRAM DESCRIPTION

In addition to the four Corporations in operation an agreement has been signed with the province of New Brunswick and final details of an agreement with the province of Manitoba for a NewStart corporation are being worked out.

The common purpose is to find out how to develop and improve methods of qualifying, for rewarding and stable employment, people who are seriously disadvantaged and who live in areas of severe unemployment and underemployment.

NewStart corporations are not intended to cope with the problems of all the population in their areas. Rather, they are experimenting, as far as possible, with the most disadvantaged.

The initial plans are based upon the results of the collection and analysis of the data required properly to assess the developmental needs of the disadvantaged population in relation to realistic job opportunities within and without the area. From these are determined the experimental projects required to develop occupational competence. The projects are designed to permit adequate measurement and evaluation of the methods and approaches used.

The accompanying descriptions reflect the differences of the problems which confront the disadvantaged population, the different stages of development of the individual corporations, and the wide variety of experimental methods being applied.

Nova Scotia NewStart Inc.

Plan of Operations, 1968

Nova Scotia NewStart's plan of action research is designed to help people with identified needs to progress through a series of programs to attain specific objectives.

Projects contain interrelated components consisting of counselling, academic upgrading, life skills development and combined work and occupational skills training.

Courses are offered in a range of career opportunities, including hospital aides, counsellor aides, teacher aides and family service aides. This consists largely of on-the-job placements. It permits the validation of the hypothesis that the preparation and employment of local people as para-professional staff can be accomplished within practical limits of time and cost.

The adult basic skills project tests techniques for developing communication and mathematical skills as a prerequisite for further instruction or employment.

Additional projects are being developed to provide supplementary income for elderly or partially disabled persons, while other projects help inshore fishermen and their wives to acquire better fishing techniques and management practices.

Prince Edward Island NewStart Inc.

Plan of Operations 1968-69

The plan includes a number of experimental components, the principal ones being, the evaluation of the employment adjustment problems of disadvantaged adults and development of achievement motivation; basic education and office skills; work orientation for female heads of households; basic farm operation and preparation for agricultural occupations; and preparation for fishing occupations and industrial skills.

Three basic education and office skills projects are being conducted to provide mathematical and communication skills. Each course accommodates twenty-four people; one group for non-farm males aged 20-35, one for male farmers and one group for females. Commercially produced programs that permit participants to advance at their own rate are being experimented with and experience gained in these three projects will determine future development.

Several short term agricultural courses have been held for farmers operating inefficient sub-marginal enterprises. Subjects included basic farm management, cole crop and potato production, basic education and vocational counselling. The cole crop and potato course are prototypes for a larger experimental program planned for late 1969.

Saskatchewan NewStart Inc.

Plan of Operations 1968

The presence of 2,000 to 2,500 Indian and Metis people with the attendant problems of their integration and adjustment to urban life add a special dimension to the challenge of the experimental program.

The Corporation's strategy is to identify clearly human resource development problems of the target population through surveys and to design experimental projects which are addressed to solutions to the problems for the disadvantaged. It has conducted employment opportunity surveys to search out the growth occupations and to implement programs which bring together the unemployed and needs of the employment market.

Male and female trainees have been involved in a new careers program, and the initial success of this project has led to further expansion of teacher aides courses and the introduction of a social work aide

course. This project is a result of the growth in acceptance and demand for para-professional staff.

In co-operation with the business community in Prince Albert, innovative approaches have been taken to preparing and upgrading people who seek a career in sales. Depending on the needs of the participants and the type of sales occupation a multi-track program has been developed. One concept that the corporation is working out involves using space in a shopping plaza as a teaching centre. Another is on-the-job training in co-operation with various businesses.

Alberta NewStart Inc.

Plan of Operations 1968

The corporation has designed a system for the acculturation and social and vocational development of the target population, most of whom are Indians and Metis. The design consists of three major program components that are inter-dependent and form the basis for the conduct of a broad range of experimental human resources development activities. These three components are:

- (a) basic development in the home community, through mobile centres at Fort Chipewyan, Janvier and Kikino-Casland;
- (b) a residential course in Lac la Biche;
- (c) an accelerated vocational training centre at Fort McMurray.

The above program is being based upon appropriate surveys of human resources and of job opportunities.

At the mobile centres, the program will provide academic upgrading, basic life skills training for all adults; vocational orientation, driver training and personal grooming for men; home economics, child care and personal grooming for women; and a day-care centre for all pre-school children belonging to the participants. By bringing the training to the community, environmental changes are minimized. Experimentation will be possible in the development of alternate methods of instruction, guidance, curriculum development, attitudinal changes and social development. Communities of similar structure but without mobile centres will be used as control units to test the changes. Operation is just beginning, with length of training varying from 3 to 9 months.

The residential program is to be provided in Lac la Biche. It is designed for the young men and women from the reserves and Metis colonies who often migrate to industrial centres without adequate preparation to adapt to modern living. All participants will be provided with academic upgrading, basic life skills training, personal grooming, hygiene, social behaviour and human relation skills necessary in the world of work. In addition, programs will be offered in driver training, basic trades training in automotive, welding, building construction, electrical and pipefitting trades for the men.

RESEARCH PERSONNEL

Research Personnel as of February, 1969 - N-60

Country of Birth	Bachelor	Master	Doctorate
Canada	29	14	3
United States	3	5	
England	1	1	
India		1	
China	1	1	
Tanzania	1		
Total	35	22	3
Name of country where last degree attained			
Canada	26	13	1
United States	8	8	1
England	1	1	
Italy			1
Total	35	22	3
Average years of experience	20	16	14
Average years with project	1	1½	1½
Average age	35	40	40
Capability in both French and English	2	11	1

DETAILED DESCRIPTION OF A PROJECT

Mobile Training Centre, Alberta NewStart

Alberta NewStart has established Mobile Training Centres in three isolated Northern Alberta communities; Janvier, Fort Chipewan and Kikino. This action-research project will test the value of the following methods in preparing disadvantaged persons for employment:

1. Basic life skills and vocational skills development should be initiated in the environment familiar to each individual and preferably in his own community;
2. The family should be considered as the integral part and focus for development plans;
3. The training environment should embody the conditions found in industry with regard to employer and employee expectations;
4. The recognition that learning and change is a gradual process requiring a sequence of training experiences leading to acquisitions of necessary social and occupational skills.

Therefore Alberta NewStart has embarked on adult training programs aimed at the whole family, in their own communities, in a work-oriented environment and with a substantial emphasis on personal, social and community skills development as well as development of employment skills.

During 1968 the physical facilities for the Training Centres were established and the three commenced operation early in 1969. These centres provide facilities for basic education, community and family counselling, home economics, introductory trades training, recreation, child day care and a kitchen-diner complex.

A planned program of community education and involvement was completed before any of the physical aspects of the centres were moved in. Community comment and recommendations assisted in the design of the projects to meet their needs. Criteria for the selection of families for participation was clearly spelled out and candidates invited to participate.

Special Committee

SUBMISSION BY THE ATLANTIC DEVELOPMENT BOARD

to the

SPECIAL COMMITTEE ON SCIENCE POLICY

of the

SENATE OF CANADA

Ottawa

December 1968

Submission by the Atlantic Development Board
to the
Special Committee on Science Policy
of the
Senate of Canada

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APPENDIXES

1. Organization Chart of the Atlantic Development Board.
2. Office of the Executive Director and Organization of the Program Division.
3. Office of the Executive Director and Organization of the Planning Division.

APPENDIXES (Cont'd)

4. The Atlantic Development Board Act, 1962, as amended.
5. Research Studies Prepared for the Board as Part of its 'Overall Economic Planning' Activities.
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December 9, 1968.

SUBMISSION BY THE ATLANTIC DEVELOPMENT BOARD

TO THE

SPECIAL COMMITTEE ON SCIENCE POLICY

OF THE

SENATE OF CANADA

1. Background, Objectives, and Functions of the Atlantic Development Board

1.1. Background of the Economic Problem in the Atlantic Region

For most of a century, the performance of the Atlantic regional economy has compared unfavorably with that of the rest of Canada. With the exception of the two wartime periods, the region has experienced slower economic growth, endured higher unemployment, and has seen a steady loss of much of its natural increase in population to other regions. Although a complete and definitive explanation of this phenomenon still appears somewhat elusive, certain causes can be identified. Some of the more important ones are: the location of the region which, in many respects, is peripheral to the Canadian economic heartland; the small size and the widely dispersed settlement pattern of its population; inadequate labor force skills, both in management and in production; lower proportion of the population in the active work force; higher unemployment with greater seasonal employment swings; lower productivity due to deficiencies in education, natural resources, and public services; migration; insufficient capital, either for infrastructure or for directly productive enterprises; and effect on the region of national economic and trade policies. In the past decade (1958-67), for example, the region averaged 10.2 per cent of the national population and 8.6 per cent of the national labor force. Unemployment in the region averaged 9.3 per cent of the regional labor force, as compared to the corresponding national figure of 5.4 per cent. Income-per-person in the region averaged 68.8 per cent of that in the country as a whole.

The above indicate some aspects of the region's economic problem. However, regardless of the relative importance of specific causes of the region's state of economic underdevelopment and inadequate income opportunities for its population, two important facts stand out: (a) the economic malaise is evident in the region as a whole and, to some degree, in virtually

every economic sector; and (b) despite all the efforts to deal with the problem to date, there is as yet no significant and convincing evidence of a breakthrough. These two facts strongly convey the conviction that what is at work in the region is a veritable system of economic retardation in which all of the elements of cause and effect interact in mutual reinforcement. This renders partial and piecemeal remedial measures largely ineffective and useless.

1.2 Objectives of the Atlantic Development Board

Although certain special agencies (concerned with different aspects of economic growth and development problems) of the federal Government have been created in recent years, they were either charged with specific functions, or were directed to tackle specific problems and/or problem areas. None of them was given the responsibility for tackling the problems of the Atlantic region in its geographic and economic totality. It was for this reason that the Atlantic Development Board was created by an Act of Parliament in 1962.

In its planning and programming activities the Board has attempted to achieve three essential principles in regional economic development: joint and closely co-ordinated development of programs with the governments of the Atlantic provinces; a concern with the overall basic structure of the regional economy and with the causes of the current problems rather than their symptoms; and federal financial assistance for essential development projects for which satisfactory financial arrangements are not otherwise available. These principles are reflected in both the structure and terms of reference of the Board.

The objectives of the Board are contained in the Atlantic Development Board Act as amended in the following terms:

"9. (1) The objects of the Board are to inquire into and report to the Minister upon programs and projects for fostering the economic growth and development of the Atlantic region of Canada, and to consider, report and make recommendations to the Minister concerning programs and projects not involving the use of the Fund and programs and projects involving the use of the Fund; and without limiting the generality of the foregoing, the Board may, in furtherance of its objects,

- (a) prepare, in consultation with the Economic Council of Canada, an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region;
- (b) keep under constant review appropriate methods of furthering the sound economic development of the Atlantic region, whether such methods involve new programs and projects or the removal

or mitigation of existing factors that may be considered to inhibit such development;

- (c) with respect to particular programs or projects that may be referred to it by the Minister or that the Board may on its own initiative investigate, inquire into, assess and report to the Minister upon the feasibility of such programs or projects and the effect thereof in relation to the economy of the Atlantic region, and make recommendations to the Minister with respect to any such programs or projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region; and

- (d) with the approval of the Governor in Council, enter into agreements with

- (i) the government of any province comprised in the Atlantic region or the appropriate agency thereof, or

- (ii) any other person,

respecting the use of the Fund in financing and assisting in financing the undertaking and carrying out of particular programs or projects described in subsection (1) of Section 16.

(2) The Board shall, to the greatest possible extent consistent with the performance of its duties under this Act, consult and co-operate with the Economic Council of Canada and all departments and other agencies of the Government of Canada having duties related to, or having aims or objects related to those of the Board."

"ATLANTIC DEVELOPMENT FUND

16. (1) Subject to subsection 4, the Minister of Finance may, on the recommendation of the Minister, pay to the Board out of the Consolidated Revenue Fund such amounts as are from time to time required by the Board for the purpose of financing or assisting in financing the undertaking and the carrying out of programs and projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region and for which satisfactory financing arrangements are not otherwise available."

1.3. Organization of the Board

The Board consists of eleven members one of whom is its Chairman.

These members are private citizens representing the four provinces which comprise the Atlantic region. They are appointed, for fixed periods, by the Governor in Council. The Board's organization chart, showing its parliamentary reporting channel and its main divisions, is given in Appendix 1.

The Board has no unit which is exclusively responsible for "scientific activities" associated with its functions. All such activities which the Board is engaged in take place in two major divisions, viz., the Program Division and the Planning Division. The major function of the former is concerned with the disbursement of assistance to development projects in the region from the Atlantic Development Fund which was also established by

Special Committee

the Atlantic Development Board Act (1962, as amended, 1963 and 1966); that of the latter is the preparation of an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region. The organization charts of these two divisions are shown in Appendices 2 and 3 respectively.

The Board has no offices outside Canada, and it has no formal agreements regarding scientific activities with organizations outside Canada.

The legislation governing the Board, the Atlantic Development Board Act, as amended, is reproduced in Appendix 4.

In carrying out its responsibilities and functions, the Board has a direct working relationship with the Economic Council of Canada in so far as it has been directed to prepare an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region in consultation with the Council. The Board's functions in relation to other federal Government agencies and departments are related to the conduct of its work. The working relationships which have evolved since the Board's inception include inter-departmental committees, joint sponsorship of research, etc. With respect to private industry and educational institutions, the Board's relationships respecting its scientific activities have been largely in the form of contractual arrangements for research studies relating both to the preparation of the development plan for the region and to the disbursement of assistance from the Atlantic Development Fund for specific projects. Studies of the former kind relate to different aspects of all sectors of the regional economy; those of the latter kind include such investigations as project feasibility studies, assistance to specific research facilities in universities, etc. In the international sphere, the Board's activities have been, for the most part, confined to the occasional participation in the review-discussions of regional development problems, policies and programs of the member countries at the O.E.C.D. (Organization for Economic Co-operation and Development) level. However, in spite of the above kinds of working relationships with other agencies and organizations, since the Board has no specific statutory functions or powers regarding "scientific activities" other than those described above, no "science policy" as such has evolved so far.

2. Personnel2.1. Board Staff

The Board has recruited its staff largely through advertisements in the press, contacts with universities, and expert staff-on-loan arrangements with other government agencies.

The personnel establishment of the Board, as at June 1968, by job-category, is given in Table A below.

Table A

Personnel Establishment of the Board
by Job-Category, as at June 1968

<u>Job-Category</u>	<u>Number</u>
Executive	4
Scientific and Professional	29
Administrative and Foreign Service	4
Technical	4
Administrative Support	<u>35</u>
Total	76

Of the above establishment, none of the "Scientific Professional" staff devotes most of his time to administrative duties.

Of the twenty-nine persons in the "Scientific and Professional" category, sixteen are or have been associated with "Scientific activities" at the Board. A distribution of these persons, by country of birth, indicating the highest university degree obtained, is shown in Table B below.

Table B

Distribution of the Board's Professional Staff Associated with
Scientific Activities, by Country-of-Birth

<u>Country of Birth</u>	<u>Highest University Degree Obtained</u>				<u>Total</u>
	<u>B.A.</u>	<u>M.A.</u>	<u>M.S.</u>	<u>Ph.D.</u>	
Austria	-	1	-	-	1
Canada	2	1	1	2	6
Great Britain	1	1	-	-	2
Guyana	-	-	1	-	1
India	-	2	-	1	3
Jamaica	-	1	-	-	1
Poland	-	-	-	1	1
Trinidad	<u>1</u> 4	<u>-</u> 6	<u>-</u> 2	<u>-</u> 4	<u>1</u> 16

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A similar distribution, by country where secondary education was obtained, is shown in Table C. below.

Table C

Distribution of the Board's Professional Staff Associated with
Scientific Activities, by Country-of-Secondary Education

<u>Country of Secondary Education</u>	<u>Highest University Degree Obtained</u>				
	<u>B.A.</u>	<u>M.A.</u>	<u>M.S.</u>	<u>Ph.D.</u>	<u>Total</u>
Canada	2	1	1	3	7
Great Britain	1	2	-	-	3
Guyana	-	-	1	-	1
India	-	2	-	1	3
Jamaica	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{-}{2}$	$\frac{-}{4}$	$\frac{2}{16}$

Table D

Distribution of the Board's Professional
Staff Associated with Scientific Activities
by Country-of-University Education

<u>Country of University Education</u>	<u>Highest University Degree Obtained *</u>				
	<u>B.A.</u>	<u>M.A.</u>	<u>M.S.</u>	<u>Ph.D.</u>	<u>Total</u>
Canada	4	2	1	1	8
Great Britain	-	2	-	2	4
India	-	2	-	-	2
U.S.A.	$\frac{-}{4}$	$\frac{-}{6}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{2}{16}$

* Four of the sixteen persons, three M.A.'s and one M.S., are at present in the process of completing their Ph.D. degree program, the first three in a Canadian university and the fourth in a U.S. university.

The professional staff members' number of years of work since their graduation from university, and the number of years they have been employed on the Board's staff, are shown in Table E below. The average age of these persons is forty years. About fifty per cent of them are now proficient or are in the process of developing the proficiency to operate effectively in Canada's two official languages.

Table E

Number of Working Years since Graduation and Number of Years of
Employment at the Board of Professional Staff Associated
with Scientific Activities

<u>Number of Working Years since Graduation</u>			
<u>Prior to Employment at the Board</u>		<u>Employment at the Board</u>	
<u>Range (years)</u>	<u>No. of Persons</u>	<u>Range (years)</u>	<u>No. of Persons</u>
Less than 5	1	Less than 1	1
5 - 9	3	1 - 2	8
10 - 14	5	2 - 3	3
15 - 20	6	3 - 4	3
	<u>16</u>	4 - 5	<u>1</u>
			<u>16</u>

The number of people on the Board's professional staff, in each degree category and for each of the years 1963 to 1968 is shown in Table F below.

Table F

Number of Persons on the Board's Professional Staff Associated with
Scientific Activities, by Degree Category, 1963-1968

<u>Year</u>	<u>Highest University Degree Obtained</u>				
	<u>B.A.</u>	<u>M.A.</u>	<u>M.S.</u>	<u>Ph.D.</u>	<u>Total</u>
1963	1	1	-	-	2
1964	1	1	-	1	3
1965	3	4	-	3	10
1966	3	3	2	2	10
1967	4	6	2	3	15
1968	4	6	2	4	16

The turnover (number) of professional staff in the above degree categories for each of the years 1963 to 1968 is indicated in Table G below.

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Table G

Turnover of Professional Staff Associated with Scientific Activities,
by Degree Category, 1963 - 1968

<u>Year</u>	<u>Highest University Degree Obtained</u>				
	<u>B.A.</u>	<u>M.A.</u>	<u>M.S.</u>	<u>Ph.D.</u>	<u>Total</u>
1963	-	-	-	-	-
1964	-	-	-	-	-
1965	-	1	-	-	1
1966	2	-	-	-	2
1967	-	1	-	1	2
1968	-	1	-	-	1

The number of persons on the Board's current professional staff associated with Scientific activities who have, since graduation, been employed on a full-time basis, by private industry, universities, provincial government departments or agencies, other federal Government departments or agencies, or other organizations is shown in Table H below.

Table H

Previous Employment Record of the Board's
Professional Staff Associated with Scientific Activities

<u>Source of Employment</u>	<u>Range (Years) *</u>				<u>Total</u>
	<u>Less than 5</u>	<u>5-9</u>	<u>10-14</u>	<u>15-20</u>	
Private Industry	1	1	-	-	2
Staff of University	5	2	-	-	7
Prov. Govt. Depts/Agencies	3	2	1	2	8
Other Federal Depts/Agencies	5	2	3	1	11
Other Organizations	5	2	2	-	9

* The total adds to more than sixteen persons as almost everyone has had work experience in more than one of the following sources of employment.

The number of university graduates given summer employment at the Board in work related to scientific and research activities in the years 1963 to 1967 is shown in Table I below.

Table I

Summer Employment of University Graduates
at the Board, 1963-1967 (Associated with Scientific Activities)

<u>Year</u>	<u>Number</u>
1963	--
1964	--
1965	--
1966	2
1967	$\frac{1}{3}$

2.2. Outside Consultants

The amount of research work the Board found it required and the variety of skills needed to permit it to effectively carry out its responsibilities were far greater than could be provided by the Board's staff itself. It was necessary, therefore, for the Board to have recourse in the use of outside consultants, both commercially operated consulting firms and the academic staff of universities. The experience of the Board with these arrangements was that the quality of the work done was very uneven, and the Board was led to the belief that agencies like itself, responsible for dealing with broad social and economic questions, would be well serviced if there were in existence centres engaged in research in the social sciences staffed by competent, interdisciplinary teams of researchers to work on many of the social and economic problems governments face.

3. Activities and Research Projects

The Board is engaged in two types of activities -- those involving the use of the Atlantic Development Fund, and those not requiring monies from the Fund. The former relate to the development projects assisted by the Board and the latter to the research projects and surveys it has carried out.

The Board's scientific and research activities fall into three broad categories:

Special Committee

- i. Socio-economic studies designed to support the planning activities defined in sub-Sections 9(1)(a) and (b) of the Act;
- ii. Studies in support of current or contemplated development projects as defined in sub-Section 9(1)(c) of the Act; and
- iii. Financial assistance to scientific and research organizations in the Atlantic region (including expenditures from the Atlantic Development Fund), as defined in Section 16 of the Act.

4. Socio-Economic Studies in Support of Planning

The Board's overall economic planning activity commenced only in mid-1965. The research studies undertaken since that time relate to the major sectors of the region's economy, and to the inter-relationships between them. Specifically, they estimate the potential that the region's resources have for supporting employment and income, the obstacles which inhibit the attainment of this potential, the policies that might eliminate these obstacles, and the impact that potential could have on the level of income and employment in the region.

Priorities among such research projects have been determined according to the importance of the problem or subject of investigation to the economic development of the region. However, in several instances, the system of priorities determined in this way has had to be modified in accordance with the availability of research personnel to work on these problems. Consequently, some important work has suffered due to shortages of expert personnel.

4.1. Research Studies

Some of the major investigations and research studies the Board has undertaken as part of its overall planning activity, intramurally or extramurally, during the period 1965-66 to 1967-68 relate to more than one province in the Atlantic region. It is therefore, difficult to provide a precise provincial distribution of the expenditures the Board has incurred in the above period on account of research studies relating to its planning activity. A complete list of these studies is, however, given in Appendix 5,

along with their respective cost to March 31, 1968. The total expenditure on extramural studies in support of the Board's intramural research and planning activities to March 31, 1968 has been \$1.8 million.

Since the bulk of the Board's research activity associated with its planning function has been of a 'diagnostic' kind whose objective is to provide a basis for determining specific priorities and policy recommendations in the development plan for promoting economic growth in the Atlantic region, no cost-effectiveness analyses have as yet been carried out on the research projects themselves. As indicated below (Section 4.2), since the Board's development plan for the region and its recommendations regarding the probable policy-mix required to effectively implement the plan are still in the process of evolution, it is premature now to comment on the necessary conditions for the most desirable future pattern of distribution of the Board's scientific activities which would contribute most to regional development.

4.2. Research Output

Besides the Board's Annual Reports, a number of research studies undertaken intramurally or commissioned by the Board from outside consultants (in support of its intramural research and overall planning activities), and relating to various economic sectors, have been completed (Appendix 5). Although varying degrees of confidentiality are still attached to the material in these studies, the reports are now being edited in preparation for general release. None of these studies has, therefore, been issued to the general public so far. The actual or expected date of completion of the studies which commenced in the 1965-68 period is shown in parenthesis at the end of each title in Appendix 5.

We believe that the Board's activities to date have made or will make significant contributions in at least three areas:

First, the Board is developing a methodology for economic planning that has never before been tried in Canada. The approach is composed of two major elements: (1) a series of sector studies concerned with the problems, prospects, and policies germane to individual sectors and industries, and (2) an integrative framework enabling them to be analyzed in terms of their inter-relationships within an organic entity. A fuller account of the

second element, which represents the innovation in the methodology of public policy formulation, is warranted at this point.

The principal tool which the Board has chosen to adopt for integrating sector studies is a set of Atlantic province input-output tables. Some five years in the making, these recently completed tables are a systematic accounting of transactions generated by the production of commodities and services in approximately fifty major categories of industrial activity. Industry by industry, they identify the disposition of output to other producers, to households or consumers, to capital formation, to government use, and to exports. Simultaneously the inputs into each industry are identified as coming from other producing sectors, from government services, from imports, and from wage-earners and other factors of production. For our immediate purposes, the principal feature of this accounting matrix is that it permits us to determine, starting with an initial change in one or more sectors, the ultimate direct and indirect effects on the economy as a whole. These are revealed both in terms of the incidence of the impact and the mechanism by which it is transmitted.

Our use of the input-output model involves seven steps, which are described below in a somewhat simplified form:

- (i) Certain activities, namely, major exporting industries and some kinds of government expenditure, can effectively be forecast without reference to how the rest of the regional economy is faring. Their prospects are determined, in other words, by external circumstance or by fiat. These forecasts have, with some exceptions, now been prepared.
- (ii) Associated with the expected levels of output will be the additions to capital stock that are required to increase productive capacity. The resulting investment must be estimated with respect to its volume and composition and distributed chronologically so as to reflect realistic lead times. Preliminary work has been completed in estimating capital-output ratios, and these will be supplemented, where possible, with specific information on capital requirements.
- (iii) The next step is to calculate the direct and indirect output

requirements from all sectors that are consistent with the forecast, including such requirements as are generated by the spending for consumption purposes of income received in the course of production. If the sectors for which independent forecasts can be made are designated as autonomous, the calculated output in all other sectors can be said to be dependent or induced. It is also incremental, in the sense that it represents additions to the levels of output in these sectors which prevailed in the base year. The results to this point are a first approximation of aggregate output.

(iv) The second approximation will consist of an estimate of government expenditure that is population-linked: principally on health, some part of education, welfare, and other administrative functions. At the same time, investment requirements in the dependent sectors will be estimated, again using the appropriate capital-output ratios applied to the new derived levels of output. A particularly important category of investment will be that of housing, in respect of which both size of population, the present housing stock, the geographic shift of population and government policy will be governing factors. As before, direct and indirect output will be calculated.

(v) As a third approximation to aggregate output, the impact of the preceding stages on imports into the region will be assembled and subjected to the conventional methods of analysis employed in identifying import substitution possibilities. The results of this analysis will be treated conditionally as potential output based on developmental possibilities rather than as a necessary outcome to the model's structural interdependence.

(vi) The penultimate step will be the conversion of sectoral output values into sectoral employment and income through the application to the former of man-output ratios. These will be adjusted up to the year of the forecast for expected productivity increases partly on the basis of historical trends and partly on the basis of independent estimates. Work on this trend analysis

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is now proceeding and is partly completed. Incomes, labor force, dependency ratios and assumed unemployment rates can then be combined to yield estimates of per capita income. At this point one can consider trade-offs between various rates of income, unemployment, and migration.

- (vii) The final step (in the use of the model) will be to check for internal consistency between population, government expenditure levels, and residual investment requirements, and to investigate the implications with respect to the demand for funds arising both from government expenditure and private capital formation.

The Board's second contribution relates to an investigation of the water resources of the Atlantic provinces. The work the Board has undertaken represents the most comprehensive analysis both with respect to the area it covers and the different aspects of resource development that has ever been undertaken in Canada. It will provide a detailed account of the sources of supply, the quantity and quality of the supply, present and anticipated demand, the legal context within which water development policy must be formulated, and the administrative implications all these aspects have for sound water management policy. The study is being carried out under the supervision of a committee of federal and provincial officials responsible for water resources in their respective jurisdictions. The extent and depth of the collaboration we have achieved represents, we believe, an important contribution to the development of joint federal-provincial participation in resource planning.

A third contribution of the Board relates to another major economic sector, that of tourism and recreation. Here too the Board has undertaken the most comprehensive survey of the character and potential of tourist and recreation activity in a large geographical area. Our study deals with the region's natural attractions, its man-made attractions, commercial activities and the conditions for their viability, the nature of the demand for these tourist and recreation facilities, and will result in the preparation of a policy framework for developing the tourist and recreation industry in the region.

In addition to these major innovations, we believe the Board has also made a significant contribution with respect to other sectors as well, to the extent that it has created a planning perspective in which to view the activities of all the important economic activities in the region, and to the extent that it has focussed attention on the future conditions that should be achieved in the sectors to permit them to make their maximum contribution to a comprehensive development plan for the region.

5. Research in Support of Development Projects

It became apparent almost right from the inception of the Board that certain major sectors of the region's economy were characterized by relatively more pressing problems and, therefore, certain development projects would have to be undertaken immediately, even before the formulation of an overall development strategy for the Atlantic region based on the Board's economic planning activity. Such projects generally involve expenditures from the Atlantic Development Fund. Considerable research had to be undertaken with regard to some of these projects to determine their economic and technical feasibility. Many of the requisite studies were beyond the ability of the relatively small staff of the Board to perform within the time available and, therefore, consultants had to be commissioned to prepare them. Appendix 6 contains a list of these studies, undertaken in the 1963-68 period, with their respective cost, to March 31, 1968. The actual or expected date of completion of these studies is indicated in parenthesis at the end of each title.

Broadly, these studies fall into four main groups: transportation, industrial parks, water supply and pollution control, and urgent social problems.

5.1. Transportation

Since the Atlantic region is relatively remote from the industrial heart of Canada, transportation has always played a major rôle in economic development. Marine transport in particular is at present on the threshold of major technological change which will have profound effects on existing ports and the development of new ones, as well as on all other parts of the transportation industry. Due to these new developments, the industrial

profile of the region may undergo significant restructuring in the years ahead. Studies were, therefore, commissioned to determine the total impact these changes may have and the adjustments they may require of the region's economy.

5.2. Industrial Parks

The availability of suitable serviced industrial land is a basic prerequisite for industrial development, particularly for the development of secondary manufacturing industries. Very few suitable sites of this kind were available in the Atlantic region. The Board, therefore, decided to assist financially in the development of industrial parks in selected centers. Studies were needed to determine suitable locations for the industrial parks and the quantity of land that might be required there. Most of these studies were prepared by consultants, and their recommendations have resulted in the establishment of a number of successful industrial parks.

5.3. Water Resources

In 1965, new regulations under the Fisher Inspection Act required higher standards of purity of water used in fish processing. As a result, many existing processing plants would have been forced to close, with the consequent serious dislocation of an important industry in the region. A number of investigations were, therefore, commissioned to determine how the problems of existing and new plants could be best met.

Akin to the problem of water have been studies to control pollution so as to maintain and restore one of the region's great natural assets - clear water for industrial and recreational purposes.

5.4. Other Studies

From time to time, the Board has been called upon to recommend measures designed to alleviate unusual and unforeseen hardships due to economic dislocation, e.g., the closing of the mines on Bell Island. Studies were, therefore, required to determine the extent of the economic distress, and to explore alternative uses of the human and physical resources.

The discovery of mineral wealth is one important spur for economic development and the Board has, therefore, participated financially, together with the province of Nova Scotia, in exploratory drilling for potash. This

has resulted in certain new information concerning the geological structure of the area. The Board, in conjunction with the province, is now prepared to underwrite some of the risks involved if private companies would be willing to continue the exploration program.

6. Assistance to Scientific Research and Development

While the Board is itself not engaged in 'basic' scientific research, it is, nevertheless, convinced that economic growth and industrial development in the Atlantic region would be greatly assisted if suitable research facilities and graduate schools were to exist there.

Provincial industrial research organizations have been operating on a limited scale in Nova Scotia and New Brunswick for some time now, but neither of these provinces had laboratory facilities adequate to service the technological requirements of modern industry. Since it was clear that such laboratories would be needed and that suitable staff would be available, the Board recommended grants of \$1,887,179 to the New Brunswick Research Council and \$2,350,000 to the Nova Scotia Research Foundation and Technical College for the purpose of constructing laboratory buildings and to assist in the purchase of suitable equipment. The buildings in New Brunswick have been completed and are in full operation; those in Nova Scotia will be completed shortly. Further grants for the purchase of scientific equipment for both institutions are now under consideration.

The Board is also of the opinion that financial assistance to provide additional facilities for research and graduate training at major universities in the region will have beneficial effects there. A grant of \$2,556,000 has, therefore, been approved for the University of New Brunswick to assist in the construction of new buildings for the Social Sciences, Engineering, Computer Research, Chemistry, Biology, and Geology. The first three of these have been completed, the Chemistry building is now under construction, and it is anticipated that work on the Biology and Geology buildings will be started soon. A grant of \$2,000,000 has been approved for Dalhousie University to assist in the construction of oceanographic research facilities, and an increase in this grant is now under consideration.

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The Board is also to furnish a grant of \$3,000,000 to Memorial University of Newfoundland. This sum is to assist in the construction of an Engineering building and to finance the purchase of requisite equipment and books. This is the only grant the Board has ever made in support of undergraduate education, but it was considered that, in the case of Newfoundland, where no technological research facilities now exist, financial assistance for the construction of an Engineering building at the University would be an appropriate step to further economic development.

Grants of \$50,000 each were made for the purchase of equipment for a geochemical laboratory in New Brunswick and an ore dressing laboratory in Nova Scotia. It is anticipated that these new facilities will assist materially in developing new mining ventures in the region.

Actual expenditures in respect of these programs for the years 1963-64 to 1967-68 are given in Table J below.

Table J

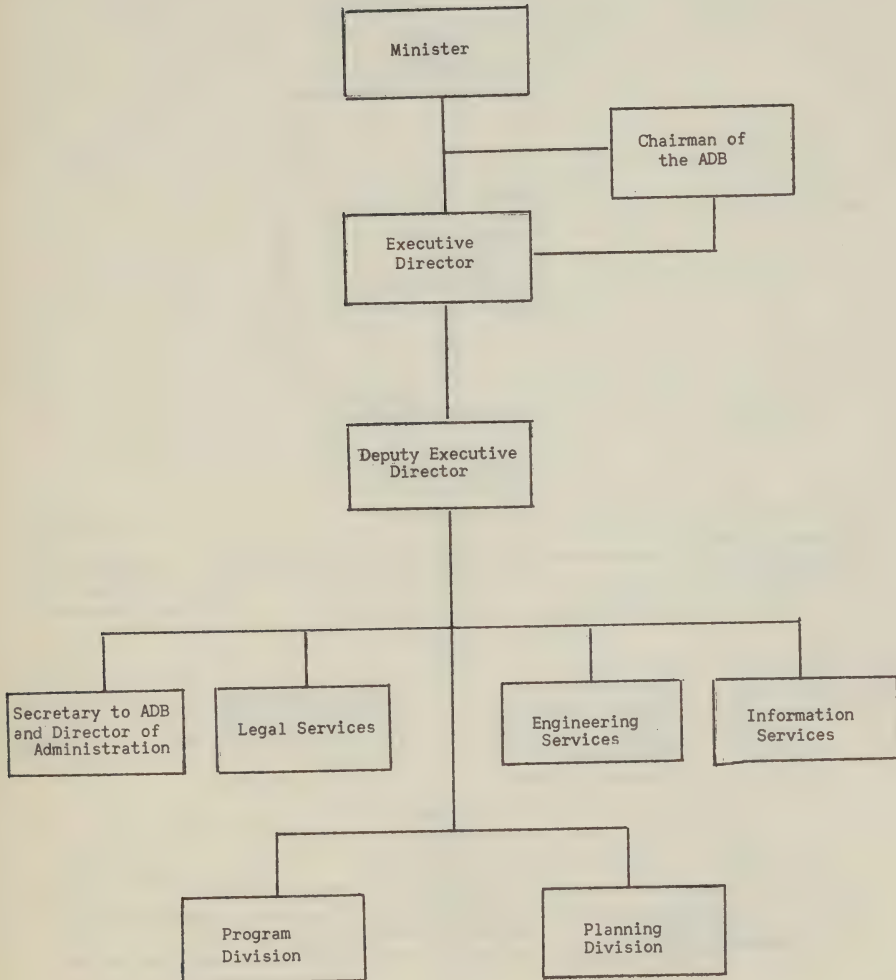
Operating and Capital Funds Expended by the Board on
Scientific Activities, 1963-64 to 1967-68

<u>Year</u>	<u>Nature of Expenditure (\$)</u>		
	<u>Operating</u>	<u>Capital</u>	<u>Total</u>
1963-64	-	-	-
1964-65	-	-	-
1965-66	-	132,589	132,589
1966-67	-	481,618	481,618
1967-68	-	1,718,662	1,718,662
<u>Total</u>	-	<u>2,332,869</u>	<u>2,332,869</u>

All the above expenditures have been on account of capital grants for the construction of buildings or for the purchase of major items of equipment. The Board does not support the operating expenses or the minor routine laboratory equipment expenses of such research facilities.

APPENDIX 1

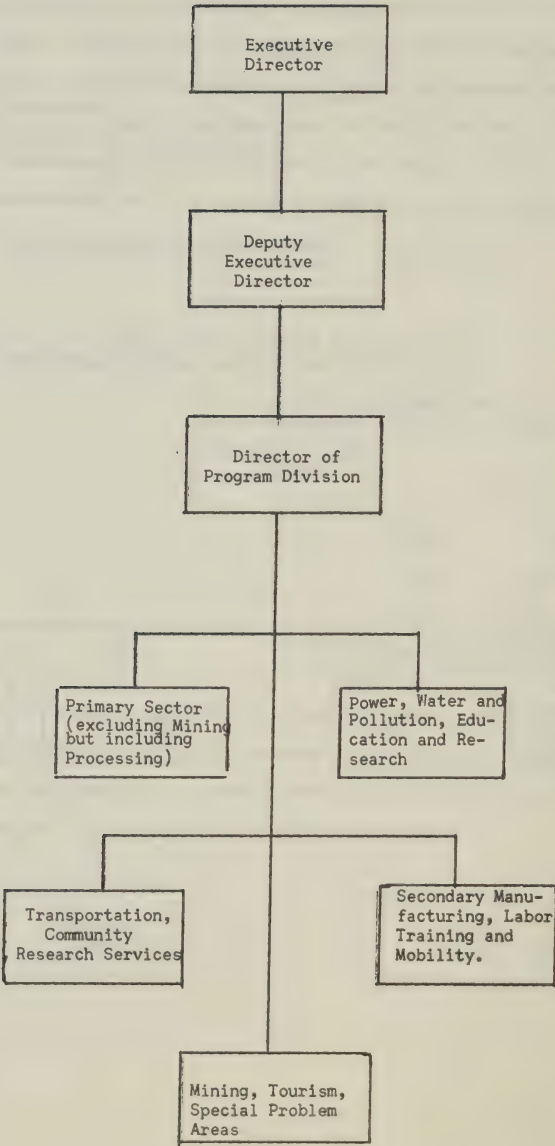
Organization Chart of the Atlantic Development Board

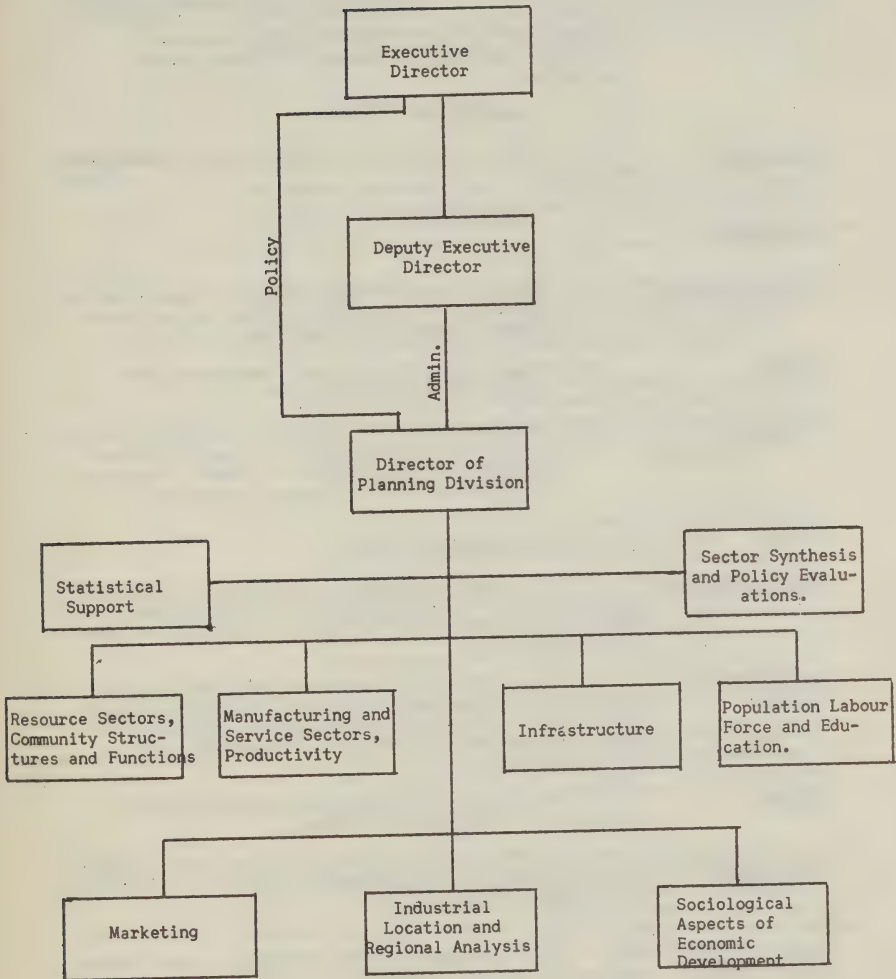


Special Committee

APPENDIX 2

Office of the Executive Director
and Organization of the Program Division



APPENDIX 3Office of the Executive Director
and Organization of the Planning Division

Special Committee

APPENDIX 4The Atlantic Development Board Act, 196211 ELIZABETH II

Chap. 10

An Act to provide for the establishment of an
Atlantic Development Board.

[Assented to 20th December, 1962]

Her Majesty, by and with the advice and consent of
the Senate and House of Commons of Canada, enacts
as follows:

SHORT TITLE

Short Title

1. This Act may be cited as the Atlantic Development Board Act.

INTERPRETATION

Definitions

2. In this Act,

"Atlantic Region"

- (a) "Atlantic region" means the region comprising the Provinces of New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland;

"Board"

- (b) "Board" means the Atlantic Development Board established by section 3; and

"Minister"

- (c) "Minister" means such member of the Queen's Privy Council for Canada as may from time to time be designated by the Governor in Council to act as the Minister for the purposes of this Act.

ATLANTIC DEVELOPMENT BOARD

Board established

3. A corporation is hereby established to be known as the Atlantic Development Board, consisting of five members to be appointed by the Governor in Council as provided in section 4.

Appointment of members

4. (1) Each of the members of the Board shall be appointed to hold office for a term of five years, except that of those first appointed one shall be appointed for a term of three years and two shall be appointed for a term of four years.

Chairman

- (2) One of the members of the Board shall be appointed to be the chairman thereof.

Eligibility for reappointment

- (3) A retiring chairman or other member of the Board is eligible for reappointment to the Board in the same or another capacity.

Travelling and living expenses

5. (1) The members of the Board shall serve without remuneration, but are entitled to be paid reasonable travelling and living expenses while absent from their ordinary place of residence in the course of their duties under this Act.

Honorarium to
Chairman

Notwithstanding subsection (1), the chairman of the Board may be paid such amount per annum as an honorarium as may be approved by the Governor in Council.

Quorum

6. Three members constitute a quorum of the Board.

Vacancy

7. A vacancy in the membership of the Board does not impair the right of the remainder to act.

Absence, etc.
of chairman

8. The Board may designate one of its members to be vice-chairman of the Board, who shall, in the event of the absence or incapacity of the chairman or if the office of chairman is vacant, act as chairman.

OBJECTS AND POWERS

Objects and
powers

9. (1) The objects of the Board are to inquire into and report to the Minister upon measures and projects for fostering the economic growth and development of the Atlantic region in Canada, and, without limiting the generality of the foregoing, the Board may, in furtherance of its objects.

- (a) prepare on a systematic and comprehensive basis, and revise as required in the light of changing circumstances, an assessment of factors relevant to economic growth in the Atlantic region;
- (b) keep under constant review appropriate methods of furthering the sound economic development of the Atlantic region, whether such methods involve new measures and projects or the removal or mitigation of existing factors that may be considered to inhibit such development;
- (c) with respect to particular measures or projects that may be referred to it by the Minister, inquire into, assess and report to the Minister upon the feasibility of such measures or projects and the effect thereof in relation to the economy of the Atlantic region, and make recommendations to the Minister with respect to any such measures or projects that in the opinion of the Board would significantly contribute to the growth and development of the economy of the Atlantic region; and
- (d) consider and report to the Minister upon any other matters that in the opinion of the Board may usefully be considered by it having regard to the need for a continuing sound economic development of the Atlantic region.

Duty of co-
operation

(2) The Board shall, to the greatest possible extent consistent with the performance of its duties under this Act, cooperate with the National Economic Development Board, the National Productivity Council and all departments, branches and other agencies of the Government of Canada having duties related to, or having aims or objects related to those of the Board.

Special Committee

ORGANIZATION

Meetings

10. The Board shall meet at such times and places as it deems necessary but shall meet at least once a year in the City of Ottawa.

Executive Director

11. (1) The Governor in Council may appoint an Executive Director of the Board, who shall hold office during pleasure and shall be paid such salary and expenses as are fixed by the Governor in Council.

Direction of work and staff

(2) The Executive Director is the chief executive officer of the Board and has supervision over and direction of the work and staff of the Board.

By-laws

12. (1) The Board may, subject to the approval of the Governor in Council, make by-laws for the regulation of its proceedings and generally for the conduct of its activities, including the establishment of advisory and other committees of the Board.

Advisory committees

(2) Any by-law made pursuant to subsection (1) establishing an advisory committee of the Board may provide for the membership thereon of persons other than members of the Board, in addition to members of the Board.

Appointment of Staff

13. (1) The Board may

(a) appoint such officers and employees as are necessary for the proper conduct of the work of the Board; and

(b) prescribe the duties of such officers and employees and, subject to the approval of the Treasury Board, prescribe the conditions of their employment.

Salaries and expenses of staff

(2) The officers and employees of the Board appointed as provided in subsection (1) shall be paid such salaries and expenses as are fixed by the Board with the approval of the Treasury Board.

Technical and special advisors

14. The Board may engage on a temporary basis or for any period of not more than two years the services of persons having technical or specialized knowledge of any matter relating to the work of the Board, to advise and assist the Board in the performance of its duties under this Act, and with the approval of the Treasury Board may fix and pay the remuneration of such persons.

Superannuation

15. (1) The Executive Director and the officers and employees of the Board appointed as provided by subsection (1) of section 13 shall be deemed to be employed in the Public Service for the purposes of the Public Service Superannuation Act, and the Board shall be deemed to be a Public Service corporation for the purposes of section 23 of that Act.

Application of Government Employees Compensation Act

(2) The Government Employees Compensation Act applies to the Executive Director and the officers and employees of the Board appointed as provided in subsection (1) of section 13 and, for the purposes of that Act, such persons shall be deemed to be employees in the service of Her Majesty.

Not agent of
Her Majesty

16. The Board is not an agent of Her Majesty and, except as provided in Section 15, the members, Executive Director and staff of the Board are not part of the public service.

FINANCIAL

Appropriation

17. All amounts required for the payment of salaries and other expenses under this Act including expenses of administration shall be paid out of moneys appropriated by Parliament for the purpose.

AUDIT

Audit

18. The accounts and financial transactions of the Board shall be audited annually by the Auditor General, and a report of the audit shall be made to the Board and the Minister.

REPORT TO PARLIAMENT

Annual report
to be made

19. The chairman of the Board shall, within three months after the termination of each fiscal year, transmit to the Minister a statement relating to the activities of the Board for that fiscal year, including the financial statements of the Board and the Auditor General's report thereon, and the Minister shall cause such statement to be laid before Parliament within fifteen days after the receipt thereof or, if Parliament is not then sitting, on any of the first fifteen days next thereafter that Parliament is sitting.

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Chap. 5

An Act to amend the Atlantic Development Board Act

[Assented to 31st July, 1963]

1962-63, c. 10 Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

1. Section 2 of the Atlantic Development Board Act is amended by striking out the word "and" at the end of paragraph (b) thereof and by adding thereto, immediately after paragraph (b) thereof, the following paragraph:

"Fund" "ba) "Fund" means the Atlantic Development Fund established by section 16; and"

2. (1) Sections 3 and 4 of the said Act are repealed and the following substituted therefor:

Board established "3. (1) A corporation is hereby established to be known as the Atlantic Development Board, consisting of eleven members to be appointed by the Governor in Council as provided in section 4,

Constitution of membership (2) The membership of the Board shall be constituted in such a manner as to reflect the economic structure of the Atlantic region.

Appointment of members 4. (1) Each of the members of the Board shall be appointed to hold office for a term of three years, except that of those first appointed four shall be appointed for a term of one year and four shall be appointed for a term of two years.

Chairman (2) The Governor in Council shall designate one of the members to serve as chairman of the Board during pleasure.

Eligibility for reappointment (3) A person who has served two consecutive terms as a member of the Board is not, during the twelve month period following the completion of his second term, eligible for reappointment."

(4) A person who, at the coming into force of this Act, held office under the Atlantic Development Board Act as a member of the Atlantic Development Board shall be deemed to have been appointed as a member of the Board under this Act

(a) in the case of the person who at the coming into force of this Act held the office of chairman of the Board, for a term of two years, and

(b) in any other case, for a term of one year.

(5) The term of each of the persons first appointed to the Atlantic Development Board after the coming into force of this Act and the term of each of the persons referred to in subsection (2) shall be calculated as if such term had commenced on the 24th day of January, 1963.

3. Section 6 of the said Act is repealed and the following substituted therefor:

Quorum

"6. A majority of the members constitutes a quorum of the Board."

4. The said Act is further amended by adding thereto, immediately after section 8 thereof, the following section:

Board agent of Her Majesty

"8A. (1) The Board, is for all purposes of this Act, an agent of Her Majesty, and its powers under this Act may be exercised only as an agent of Her Majesty.

Contracts

(2) Subject to the approval of the Governor in Council, the Board may, on behalf of Her Majesty, enter into contracts in the name of Her Majesty or in the name of the Board.

Property

(3) Property acquired by the Board is the property of Her Majesty and title thereto may be vested in the name of Her Majesty or in the name of the Board.

Proceedings

(4) Actions, suits or other legal proceedings in respect of any right or obligation acquired or incurred by the Board on behalf of Her Majesty, whether in its name or in the name of Her Majesty, may be brought or taken by or against the Board in the name of the Board in any court that would have jurisdiction if the Board were not an agent of Her Majesty."

5. Section 9 of the said Act is repealed and the following substituted therefor:

Objects and powers

"9. (1) The objects of the Board are to inquire into and report to the Minister upon programs and projects for fostering the economic growth and development of the Atlantic region of Canada, and to consider, report and make recommendations to the Minister concerning programs and projects not involving the use of the Fund and programs and projects involving the use of the Fund; and without limiting the generality of the foregoing, the Board may, in furtherance of its objects,

- (a) prepare, in consultation with the Economic Council of Canada, an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region;
- (b) keep under constant review appropriate methods of furthering the sound economic development of the Atlantic region, whether such methods involve new programs and projects or the removal or mitigation of existing factors that may be considered to inhibit such development;
- (c) with respect to particular programs or projects that may be referred to it by the Minister or that the Board may on its own initiative investigate, inquire into, assess and report to the Minister upon the feasibility of such programs or projects and the effect thereof in relation to the economy of the Atlantic region, and make recommendations to the Minister with respect to any such programs or projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region; and

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- (d) with the approval of the Governor in Council, enter into agreements with
- (i) the government of any province comprised in the Atlantic region or the appropriate agency thereof, or
- (ii) any other person,
- respecting the use of the Fund in financing or assisting in financing the undertaking and the carrying out of particular programs or projects described in subsection (1) of section 16.

Duty of co-operation

(2) The Board shall, to the greatest possible extent consistent with the performance of its duties under this Act, consult and co-operate with the Economic Council of Canada and all departments, branches and other agencies of the Government of Canada having duties related to, or having aims or objects related to those of the Board."

6. Section 16 of the said Act is repealed and the following heading and section substituted therefor:

"ATLANTIC DEVELOPMENT FUNDPayments out of Consolidated Revenue Fund

16. (1) Subject to subsection 4, the Minister of Finance may, on the recommendation of the Minister, pay to the Board out of the Consolidated Revenue Fund such amounts as are from time to time required by the Board for the purpose of financing or assisting in financing the undertaking and the carrying out of programs and projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region and for which satisfactory financing arrangements are not otherwise available.

Atlantic Development Fund established

(2) There shall be a special account in the Consolidated Revenue Fund to be known as the Atlantic Development Fund, to which shall be credited all amounts paid by the Minister of Finance to the Board under subsection (1) and to which shall be charged all payments in respect of programs or projects described in that subsection.

Approval of programs or projects

(3) No payments may be made by the Minister of Finance to the Board under sub-section (1) except in respect of a program or project described in that subsection that has been approved by the Governor in Council.

Total of amounts that may be paid

(4) The total of all amounts that may be paid by the Minister of Finance to the Board under subsection (1) and credited to the Atlantic Development Fund is one hundred million dollars."

7. Section 17 of the said Act is repealed and the following substituted therefor:

Appropriations

"17. All expenditures under this Act including amounts required for the payment of salaries, technical and economic surveys and other expenses including expenses of administration, except any amount described in sub-section (1) of section 16, shall be paid out of moneys appropriated by Parliament therefor."

Coming into force

8. This Act shall come into force on a day to be fixed by proclamation of the Governor in Council.

14-15 ELIZABETH II

Chap. 31

An Act to amend the Atlantic Development Board Act.

[Assented to 11 July, 1966]

1962-63, c. 10; Her Majesty, by and with the advice and consent of the
1963, c.5 Senate and House of Commons of Canada, enacts as follows:

1963, c.5,
s.4

1. Subsection (2) of section 8A of the Atlantic Development Board Act is repealed and the following substituted therefor:

Contracts

"(2) The Board may, on behalf of Her Majesty, enter into contracts in the name of Her Majesty or in the name of the Board."

1963, c.5,
s. 5

2. Paragraph (d) of subsection (1) of section 9 of the said Act is repealed and the following substituted therefor:

"(d) enter into agreements with the government of any province comprised in the Atlantic region or the appropriate agency thereof, subject to approval thereof by the Governor in Council, or enter into agreements with any other person, providing for

(i) the undertaking by the Board of any programs or projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region and for which satisfactory financing arrangements are not otherwise available,

(ii) the joint undertaking by the Board and the province or agency thereof or person of programs or projects described in subparagraph (i), or

(iii) the payment by the Board to the province or agency thereof or person of contributions in respect of the cost of programs or projects described in subparagraph (i)."

3. The said Act is further amended by adding thereto, immediately after section 9 thereof, the following section:

Provision to be
included in agree-
ments.

"9A. An agreement entered into pursuant to paragraph (d) of subsection (1) of section 9 shall, where appropriate, specify the respective proportions of the revenues from any program or project to which the agreement relates that are to be paid to the Board and the province or agency thereof or person."

1963, c. 5,
s. 6

4. (1) Section 16 of the said Act is repealed and the following substituted therefor:

Atlantic Devel-
opment Fund
established

"16. (1) There shall be a special account in the Consolidated Revenue Fund to be known as the Atlantic Development Fund.

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Credits and
charges to Fund

(2) There shall be credited to the Fund, in addition to the amounts credited thereto pursuant to subsection (1) of section 16A, all revenues of the Board under agreements entered into pursuant to paragraph (d) of subsection (1) of section 9 and there shall be paid out of the Consolidated Revenue Fund and charged to the Fund all expenditures under agreements entered into pursuant to paragraph (d) of subsection (1) of section 9.

Limitation.

(3) No payment shall be made out of the Consolidated Revenue Fund under this section in excess of the amount of the balance to the credit of the Fund.

Payment out of
Consolidated
Revenue Fund

16A. (1) Subject to subsection (2), the Minister of Finance may, on the recommendation of the Minister, credit to the Fund out of the Consolidated Revenue Fund such amounts not exceeding in the aggregate one hundred and fifty million dollars as are from time to time required by the Board under agreements entered into pursuant to paragraph (d) of subsection (1) of section 9.

(2) No amount may be credited by the Minister of Finance to the Fund under subsection (1) in respect of programs or projects described in an agreement entered into under paragraph (d) of subsection (1) of section 9 with a province or agency thereof, unless the agreement has been approved by the Governor in Council."

Approval of
agreements

(3) For the purpose of section 16A of the said Act as enacted by this section, all amounts credited or charged to the Atlantic Development Fund pursuant to section 16 of the said Act before the coming into force of this Act shall be deemed to have been credited or charged, as the case may be, to the Atlantic Development Fund pursuant to sections 16 and 16A of the said Act as enacted by this section.

APPENDIX 5

Research Studies Prepared for the Board as Part of its
'Overall Economic Planning' Activity

<u>Sector</u>	<u>Project-Title</u>	<u>Cost (\$)*</u>
A. <u>AGRICULTURE</u>	1. The Competitive Position of Agricultural Enterprises in Nova Scotia, New Brunswick and Prince Edward Island. (1968).	58,200
	2. Past Trends and Prospects for Agriculture in the Atlantic Provinces. (1967).	16,461
B. <u>FISHERY</u>	1. Fishery in the Atlantic Provinces. (1968).	xx
C. <u>FORESTRY</u>	1. Demand for and Supply of Hardwood in the Atlantic Provinces. (1966).	50,000
	2. Forestry in the Atlantic Provinces. (1968).	46,303
D. <u>HUMAN RESOURCES</u>	1. Barriers to Manpower Mobility in Economically Lagging Areas of Newfoundland and Labrador, Nova Scotia, New Brunswick and Quebec. (1968).	35,000
	2. Education as a Factor in the Growth of the Atlantic Provinces. (1968).	24,840
	3. Past and Future Trends in the Labor Force of the Atlantic Provinces. (1966).	xx
	4. Recent Trends in the Determinants of Population Growth in the Atlantic Provinces and Provincial Projections by Age and Sex for the Period 1966-1991. (1966).	xx
	5. Training and Other Sources of Supply of Skilled and Technical Manpower in the Atlantic Provinces: Part 1 - Past Developments and Continuing Problems. (1968).	xx
E. <u>INPUT-OUTPUT ANALYSIS</u>	1. Derivation of Capital Stock and Capital-Output Ratios for Industries in the Atlantic Provinces. (1968).	xx
	2. Inter-Industry Flow of Goods and Services in the Atlantic Provinces. (1968; 1969).	126,403
	3. Projection of Consumption Demand in the Atlantic Provinces. (1968).	xx
F. <u>MANUFACTURING INDUSTRY</u>	1. The Manufacturing Sector of the Atlantic Region. (1968).	xx
	2. New Manufacturing Establishments and Expansions in Canada and in the Atlantic Region, 1956-1965. (1967).	xx

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<u>Sector</u>	<u>Project-Title</u>	<u>Cost (\$)</u> <u>x</u>
F. <u>MANUFACTURING</u> <u>INDUSTRY</u> (Cont'd)	3. Manufacturing Opportunity Studies (covering the following industry groups):	
	a. Asbestos Products. (1969).	#
	b. Canvas Products. (1969).	#
	c. Furniture and Fixtures. (1969).	#
	d. Fruits and Vegetables. (1969).	#
	e. Metal Fabricating. (1969).	#
	f. Paper Products. (1969).	#
	g. Plastics. (1969).	#
G. <u>MARKETING</u>	1. Groundfish Trade between the Atlantic Coast (including Quebec) and the United States. (1969).	5,000##
H. <u>MINING</u>	1. The Mineral Resources of the Atlantic Provinces. (1966-68).	x
I. <u>SOCIOLOGICAL</u> <u>FACTORS</u>	1. Sociological Factors in the Economic Development of the Atlantic Pro- vinces. (1967).	10,000
J. <u>TOURISM AND</u> <u>RECREATION</u>	1. The Tourist Industry in Newfound- land, New Brunswick and Nova Scotia. (1968).	366,707
K. <u>TRADE</u>	1. The Export Trade of the Atlantic Provinces. (1967).	3,000
L. <u>TRANSPORTATION</u>	1. The Deep Water Harbors of the Atlantic Provinces. (1968).	8,469
	2. Transportation Network and Urban Systems of the Provinces of Nova Scotia and New Brunswick. (1966).	3,500
M. <u>URBAN CENTERS</u>	1. The Structure and Functions of Urban Centers in the Atlantic Provinces. (1968).	148,929
N. <u>WATER RESOURCES</u>	1. The Water Resources of the Atlantic Region. (1966-69).	902,322
O. <u>OTHER STUDIES</u>	1. Analysis of Federal Expenditures in the Atlantic Provinces. (1967).	4,500
	2. Development of the Newfoundland Economy since Confederation. (1965).	7,000
	3. Industrial Location, with Special Reference to the Atlantic Provinces. (1965).	5,841
	4. Major Economic Indicators - Atlantic Region. (1967).	xx
<u>TOTAL</u>		<u>1,822,475</u>

Notes

- * All 'cost' figures are cumulative to March 31, 1968.
- ** These studies have been undertaken intramurally, whereas the others have been commissioned by the Board from outside consultants. Some of these studies, as indicated, are currently under way, and are scheduled for completion in early 1969.
- # All these studies are now under way, and will be completed by early 1969. However, no expenditure had been incurred on account of any of these studies prior to March 31, 1968.
- ## This is on account of only one section of this study that is being prepared extramurally; the rest of the study is being carried out intramurally.

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APPENDIX 6

Research Studies Prepared for the Board as Part of its
'Assistance to Development Projects' Activity

<u>Sector</u>	<u>Project-Title</u>	<u>Cost (\$)*</u>
A. <u>AGRICULTURE</u>	1. Agricultural Land Mapping. (1968).	5,000
B. <u>HUMAN RESOURCES</u>	1. Minto-Chipman, N.B., Labor Force. (1965).	3,700
C. <u>INDUSTRIAL PARKS</u>	1. Layout and Design of Proposed Water Front Industrial Park at Site of former Point Edward Naval Base, Cape Breton, N.S. (1968).	36,989
	2. Industrial Park Needs at various centers in New Brunswick and Nova Scotia. (1966).	70,000
	3. Industrial Park Needs in Charlottetown, P.E.I. (1967).	10,000
	4. Industrial Park Needs in the Metropolitan Area of St. John's, Nfld. (1967).	25,000
	5. Survey and Pre-Design of a Sewer System for the Industrial Park in Stellarton, N.S. (1967).	3,150
D. <u>MARKETING</u>	1. Marketing Possibilities for Sydney Steel. (1968).	5,000
	2. Marketing Study of Selected Steel Products of Sydney, N.S. (1967).	12,776
E. <u>MINING</u>	1. Beneficiation Research Program on Silica Sand. (1966).	3,000
	2. Beneficiation Research Program on Wabana Iron Ore, Bell Island, Nfld. (1965).	300,000
	3. Potash Exploration in Nova Scotia. (1967).	265,801
F. <u>POWER</u>	1. Foundation Investigation for Tidal Power Development in Upper Bay of Fundy, New Brunswick. (1965).	100,000
	2. Investigation for a Possible Power Site at Minas Basin, Bay of Fundy, N.B. (1967).	70,000
G. <u>TRADE</u>	1. Economic Study of Grain Trade via Atlantic Ports. (1965).	25,000
H. <u>TRANSPORTATION AND COMMUNICATION</u>	1. Engineering and Economic Feasibility Studies re Submarine Cable between Prince Edward Island and the Mainland. (1964).	10,000
	2. Engineering Investigations for Deep Water Harbor, Ore Dock, and Ancillary Facilities at Belledune Point, N.B. (1965).	86,253

<u>Sector</u>	<u>Project-Title</u>	<u>Cost (\$)</u> x
H. <u>TRANSPORTATION AND COMMUNICATION</u> (Cont'd)	3. Preliminary Study of Economic Aspects of Effects on the Atlantic Ports of Winter Navigation in the St. Lawrence River and Gulf of St. Lawrence. (1964).	10,000
	4. St. John Harbor Bridge Throughway Complex. (1968).	8,014
	5. Stream Gauging Survey of North West Brook near Trepassy, Nfld. (1967).	2,232
	6. Study of the Effects of the Northumberland Strait Causeway upon Prince Edward Island. (1968).	34,178
	7. Study of Gander Airport as a Major Air Cargo Staging Point and Industrial Center. (1967).	3,449
	8. Technical Aspects of Winter Navigation in the St. Lawrence River and the Gulf. (1964).	4,540
	9. Trans-Atlantic Container Shipping Operations from the Ports of Halifax, N.S. and St. John, N.B. (1966).	23,976
I. <u>WATER RESOURCES</u>	1. Engineering Investigation of a Suitable Water Supply System for Fish Plant at Shippegan, N.B. (1965).	11,310
	2. Investigation of Water Supplies to Fish Processing Plants and Water Resources Survey at Trepassy, Nfld. (1968).	118,870
	3. Investigation of Water Supply in Bay St. George, Stephenville, Nfld. (1968).	40,000
	4. Study and Investigation of Purification of Salt Water for use in Fish Processing Plants. (1967).	19,947
	5. Study of Ground Water Resources in Nova Scotia. (1968).	26,500
	6. Survey of Water Resources in North Rustico, P.E.I. (1968).	22,830
	7. Survey of Water Supplies in Witless Bay, Nfld. (1968).	6,211
	8. Water Supplies and Needs in Placentia, Nfld. (1967).	19,501
	9. Water Supplies and Needs in St. Mary's Bay Area, Nfld. (1968).	17,988
	10. Water Supplies in Alder Point, Isle Madame-St. Peters, Cape Sable Island and Digby Neck, N.S. (1968)	112,657
	11. Water Supplies in Bay Bulls area of Newfoundland. (1967).	2,913

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<u>Sector</u>	<u>Project-Title</u>	<u>Cost (\$)*</u>
I. <u>WATER RESOURCES</u> (Cont'd)	12. Water Supplies in Charlotte County and Caraquet Areas of New Brunswick. (1968).	119,569
	13. Water Supply at Come-by-Chance, Nfld. (1966).	12,800
J. <u>OTHER STUDIES</u>	1. Development Plan for Ernest Harmon Air Base, Stephenville, Nfld. (1968).	40,000
	2. Economic Survey of Bell Island, Nfld. (1967)	26,661
	3. Industrial Opportunities in Cape Breton, N.S. (1966).	32,000
	4. Potential Industrial Sites in the Halifax Area. (1968).	20,000
	5. Study of Waste Products of Foods and Beverages Industries in the Atlantic Provinces. (1966).	9,600
	<u>TOTAL</u>	<u>1,777,415</u>

Note:

* All 'cost' figures are cumulative to March 31, 1968.

*Report to
Senate Committee on Science Policy*

Prairie Farm Rehabilitation Act

Department of Forestry and Rural Development

March 1969

Special Committee

Information on P.F.R.A.
with reference to
Senate Committee on Science Policy

Mandate

1. The Prairie Farm Rehabilitation Act, assented to by the Government of Canada, April 17, 1935; amendments to the Act assented to March 31, 1937, April 5, 1939, June 14, 1941, May 14, 1948, June 30, 1951 and June 28, 1955.

2. The purpose and objective of the P.F.R.A. program are summarized in Section 4 of the Act:

"...to secure the rehabilitation of the drought and soil drifting areas in the Provinces of Manitoba, Saskatchewan and Alberta, and to develop and promote within these areas systems of farm practice, tree culture, water supply, land utilization and land settlement that will afford greater economic security...."

Importance and pertinence of research in the P.F.R.A. program

3. In certain areas, such as systems of farm and ranch practice, tree culture and land utilization, results of research carried out by other agencies have been applied,-- particularly research done by the Research Branch of the Department of Agriculture. In applying research results, some investigations, tests and studies are carried on to improve mechanical and cultural techniques.

4. In the field of water supply, conservation and use, considerable research has been conducted with reference to the problems encountered in the investigation, design and construction of complex works for water conservation projects. Research is carried out as required for project planning and construction, on a continuing basis, as part of the regular work of Engineering Divisions. Personnel and funds are generally not specifically designated for research.

5. Particulars concerning the above activity are as follows:

6. Category - Engineering Works - Specifications and Design

Soil Mechanics Division:

6.(a) Research on shear strength and stability of highly plastic clays and clay shales in foundations and natural slopes. Using observational approach in the field and residual strength in laboratory. Commenced in 1950.

Staff - Masters 0.1, Bachelors 0.1, technicians 2.0 man-years. Average annual cost - \$20,000.

6.(b) Research on design, construction methods and observational apparatus for earth dams and related structures. Evaluating designs on the basis of performance to develop safer and more economical dams. Commenced in 1941. Staff - Bachelors 0.5, technicians 2.0 man-years. Average annual cost - \$25,000.

6.(c) Research on heave and rebound of concrete water development structures resulting from frost action and soil swelling. Observation of existing structures and theoretical studies. Commenced in 1957. Staff - Masters 0.2, technicians 1.5 man-years. Average annual cost - \$13,000.

6.(d) Research on canal and dugout linings. Determining effectiveness of various types of materials and methods used to line and waterproof canals and dugouts. Commenced in 1950. Staff - Bachelors 0.1, technicians 0.2 man-years. Average annual cost - \$3,000.

6.(e) Research on embankment slope protection. Observing performance of existing slope protection. Commenced in 1960. Staff - Bachelors 0.7, technicians 1.5 man-years. Average annual cost - \$18,000.

6.(f) Research on improvement of field exploration and sampling methods. Developing and comparing different techniques in foundation and site exploration. Commenced in 1941. Staff - Bachelors 0.1, technicians 0.2 man-years. Average annual cost - \$3,500.

Design Division:

6.(g) Hydraulic model tests - three to six projects annually. Typical projects undertaken - hydraulic model study of spillway approach channel to Shellmouth Dam; hydraulic model study of gating arrangement in Qu'Appelle Dam conduit; hydraulic model study of side-channel spillway for Penticton Creek diversion dam; feasibility of using asphalt waterstops in South Saskatchewan River Dam. Other modelling projects for specific purposes will be undertaken as required on a continuing basis. The results of these applied research studies are applicable, to some degree, in other areas. Staff - Masters 1.0, technicians 2.0 man-years. Average annual cost - \$20,000

7. Category - Engineering - Materials

Soil Mechanics Division:

7.(a) Applied research on up-grading of natural aggregates for concrete construction. Study of deleterious materials occurring in aggregates and methods of removal, evaluation of beneficial aggregates in concrete mixes in field and laboratory. Commenced in 1950. Staff - Bachelors 0.1, technicians 0.3 man-years. Average annual cost - \$4,500.

7.(b) Applied research in concrete technology, including restoration and repair, with respect to Western Canadian conditions and sulphate environment. Appraisal of techniques in field and laboratory. Commenced in 1950. Staff - Bachelors 0.1, technicians 0.2 man-years. Average annual cost - \$4,000.

7.(c) Study of cementitious materials and admixtures for concrete structures. Long term observations of laboratory and field specimens. Commenced in 1955. Staff - Bachelors 0.1, technicians 1.0 man-years. Average annual cost - \$9,000.

Regional Engineering Division:

7.(d) Evaluation of sealing compounds in construction of articulated joints in concrete water control structures.

To evaluate the effectiveness of various sealers (polymers, epoxy resins, bitumens) in regard to water tightness, bonding qualities and permanence. To determine field application requirements and cost. Commenced 1960. Staff - Bachelors 0.2, technicians 0.1 man-years. Average annual cost - \$3,000.

8. Category - Economic, Social and Institutional Aspects of Water Resources Research

Determination of Annual Cost of Irrigation Districts in Alberta. To determine the true annual cost of operating, maintaining and periodic replacement of capital works and to compile an inventory of works and their life expectancy. Commenced 1964, completed 1968. Staff - Bachelors 1.4, technicians 2.0 man-years. Average annual cost \$33,000.

9. Category - Water Cycle

Regional Engineering Division:

9.(a) Wilson Creek Experimental Watershed. To study in broad terms the interrelation of climate, hydrology, land forms, vegetive cover, and their effect on runoff, erosion and sedimentation in the Manitoba Escarpment watersheds. Commenced in 1957, expect to complete in 1972. Staff - Bachelors 2.0, Under-graduate assistants 0.5, technicians 2.5 man-years. Average annual cost \$34,000.

Hydrology Division:

9.(b) Evaporation from lakes and reservoirs on the Canadian prairies. Using new data and new techniques, to update a report on this subject published in 1952. Commenced in 1965, expect to complete in 1970. Staff - Bachelors 0.1, technicians 0.2. Average annual cost \$1,000.

9.(c) Thermo-structure of prairie reservoirs. To obtain information on the thermo-structure of selected small lakes and reservoirs on the prairies. Commenced in 1963, expect to complete in 1970. Staff - Bachelors 0.1, technicians 0.1 man-years. Average annual cost - \$750.

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9.(d) Regional Characteristics of Recession Curves. To analyze on a regional basis, from recorded hydrographs, research curve characteristics for prairie streams. Commenced in 1966, expect to complete in 1969. Staff - Bachelors 0.2, technicians 0.3 man-years. Average annual cost - \$2,000.

10. Publications in connection with the above research activities:

<u>Title</u>	<u>Author</u>	<u>Published</u>
Soil Mechanics as Applied to PFRA Problems with Special Reference to the Proposed St. Mary Dam	R. Peterson	The Engineering Journal, May 1945
Steel Sheet Piling Studies	J.L. Jaspar & A.S. Ringheim, Soil Mechanics Engineers	The Proceedings of the Third International Conference on Soil Mechanics & Foundation Engineering, Switzerland 16th to 27th Aug. 1953, Vol. II, Session 8.
Study of Several Low Earth Dam Failures	R. Peterson & N.L. Iverson, Soil Mechanics Engineers	" " "
Design & Construction of Earth Dams in Western Canada	R. Peterson	The Engineering Journal, February 1957
Test Apparatus in Earth Embankments	N. Peters	The Twelfth Canadian Soil Mechanics Conference, Saskatoon, Sask., Dec. 8 & 9, 1958
Recent Trends in Earth Dam Engineering	R. Peterson	1967 Congress of Canadian Engineers, Montreal, Que., May 29 - June 2, 1967, Series "D" preprints
Studies of Bearpaw Shale at a Damsite in Saskatchewan	R. Peterson	Proceedings of the American Society of Civil Engineers, August 1954, Vol. 80, Sup. No. 476
Studies of Several Dam Failures on Clay Foundations	R. Peterson, N.L. Iverson & P.J. Rivard, Soil Mechanics Engineers	Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, London, August 1957
Rebound in the Bearpaw Shale, Western Canada	R. Peterson	Bulletin of the Geological Society of America, September 1958, Vol. 69, pp. 1113-1124

<u>Title</u>	<u>Author</u>	<u>Published</u>
Limitations of Laboratory Shear Strength in Evaluating Stability of Highly Plastic Clays	R. Peterson, P.J. Rivard, J.L. Jaspar & N.L. Iverson	Proceedings of A.S.C.E. Research Conference on Shear Strength of Cohesive soils (1960)
The Effect of Test Techniques on the Shear Strength of Western Canadian Clays	L.G. Chan & P.J. Rivard, Soil Mechanics Engineers	Laboratory Shear Testing of Soils, 1963, Special Technical Publication No. 361, A.S.T.M.
Shellmouth Dam Test Fill	P.J. Rivard & A. Kohuska	Canadian Geotechnical Journal Vol. II, No. 3, August 1965
Heave of Spillway Structures on Clay Shales	R. Peterson & N. Peters, Soil Mechanics Engineers	Canadian Geotechnical Journal, Vol. I, No. 1
Frost Action in Hydraulic Structures and Roads on the Canadian Prairies	C.A. L'Ami	M.Sc. Thesis, Dept. Civil Engineering, University of Saskatchewan, October, 1959. Unpublished.
Third Progress Report on Experimental Canal and Dugout Lining Program	T.G. Goodwin & R. Peterson	PFRA Soil Mechanics and Materials Division; unpublished. (March 1947)
Evaluation of Selection of Aggregates for Concrete Construction	G.C. Price, Concrete Engineer	Thirty-ninth Annual Convention of the Canadian Good Roads Association, Montreal, Sept. 30 - Oct. 3, 1958
Experience with Concrete in Sulphate Environments in Western Canada	G.C. Price & R. Peterson	Thorvaldson Symposium, ACI Convention, Toronto, April 7, 1967. To be published in Thorvaldson Memorial Volume
Investigation of Concrete Materials for the South Saskatchewan River Dam	G.C. Price, Concrete Engineer	Proceedings of the American Society for Testing and Materials, Philadelphia, Pa. Vol. 61, 1961

Wilson Creek Experimental Watershed

Report on Background Information - Wilson Creek Watershed - by C. R. Stanton, P.F.R.A. Winnipeg, Man. June 12, 1958.

Report to Headwater Flood and Erosion Control Committee on Activities in Wilson Creek Watershed, November 1, 1957 to December 31, 1958 - by C. R. Stanton, P.F.R.A. Winnipeg. January 2, 1959.

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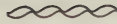
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APPENDIX 45

**DEPARTMENT OF NATIONAL REVENUE
CUSTOMS AND EXCISE
CONNAUGHT BUILDING
OTTAWA, CANADA**



A BRIEF FOR THE SPECIAL COMMITTEE ON SCIENCE POLICY

SENATE OF CANADA

OCTOBER 1968

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PREFACE

The Department of National Revenue, Customs and Excise, has as its primary responsibility the collection of revenue. The administration and enforcement of the Customs and Excise laws, and the regulations established thereunder, involve the assessment and collection of the Customs duties, Excise duties and Excise taxes applicable on imported and domestically produced goods, and the prevention of smuggling and other fraudulent or evasion practices in respect of the non-payment of Customs and Excise revenues.

The department also performs a number of functions on behalf of other departments in the enforcement of laws which relate to international travel, trade and shipping. These non-revenue functions include primary immigration screening of persons entering Canada, the enforcement of various controls imposed on imports and exports and on the inward and outward movement of shipping.

The Customs administration is primarily involved with the movement of goods across our national border. In addition to collecting revenue, it ensures that Canadian industry receives the benefits extended by the Customs law. Excise activities, on the other hand, are almost exclusively concerned with the collection of revenue in respect of domestic transactions.

The department is comprised of six branches, namely, Customs, Operations, Excise Tax, Inspection, Financial and Management Services and Personnel Administration, each engaged in a number of specific activities, as reflected in the chart shown on page (iii).

Although the department is concerned essentially with the collection and protection of revenue, it has a Customs and Excise Laboratory engaged in chemical analytical work. As well, Customs and Excise officers are interested in a continuing study to streamline controls, refine procedures, standardize documents, provide for the

Special Committee

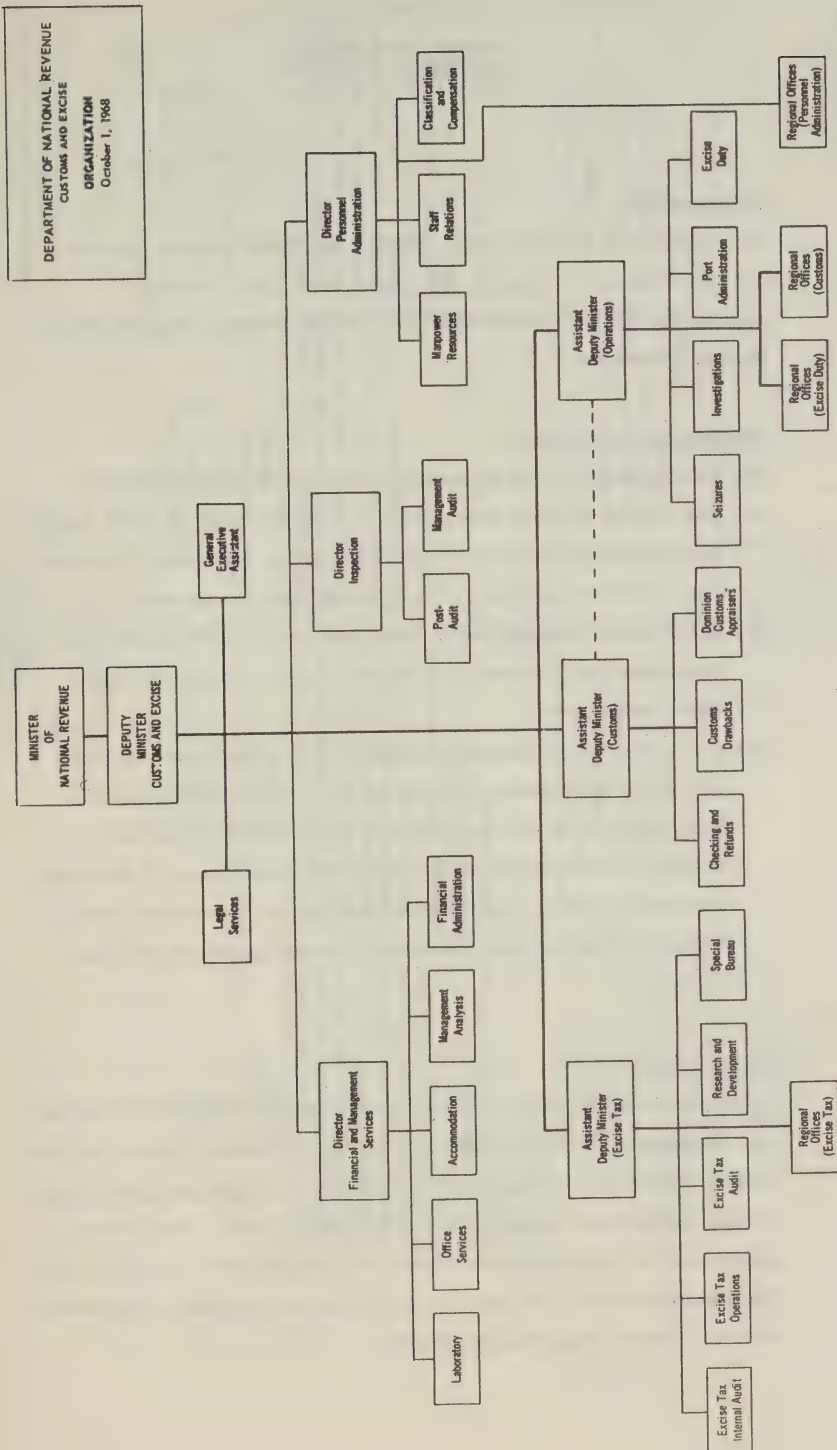
maximum use of manpower and to devise new measures for expediting and facilitating the entry and release of goods, and the movement of people.

In the light of the foregoing, this brief has been prepared in three parts, as follows:

Part A - Customs and Excise Laboratory.

Part B - Possible Improvements due to technical developments and the type of technical advice sought in the past.

Part C - Research in the Excise Tax Branch.



PART A

CUSTOMS AND EXCISE
LABORATORY DIVISIONIntroduction

This brief was prepared for the Special Committee on Science Policy, Senate of Canada. It deals with the scientific activities of the Customs and Excise Laboratory, Department of National Revenue.

1. Historical Development

The development of the Laboratory took place in three steps.

- (a) The Inland Revenue Laboratory was established in 1887 under the Department of Inland Revenue. This laboratory carried out, for the most part, food, drug, and excise work.
- (b) The Customs Laboratory was established in 1898 under the Department of Customs to examine sugars, molasses, oils, fats, waxes, etc.
- (c) The Customs and Excise Laboratory was established in 1921 under the Department of Customs and Excise following the amalgamation of the Departments of Inland Revenue and Customs. This Department became the Department of National Revenue in 1927. The Customs and Excise Laboratory was a branch of the National Research Council between 1943 and 1954.

2. Organization

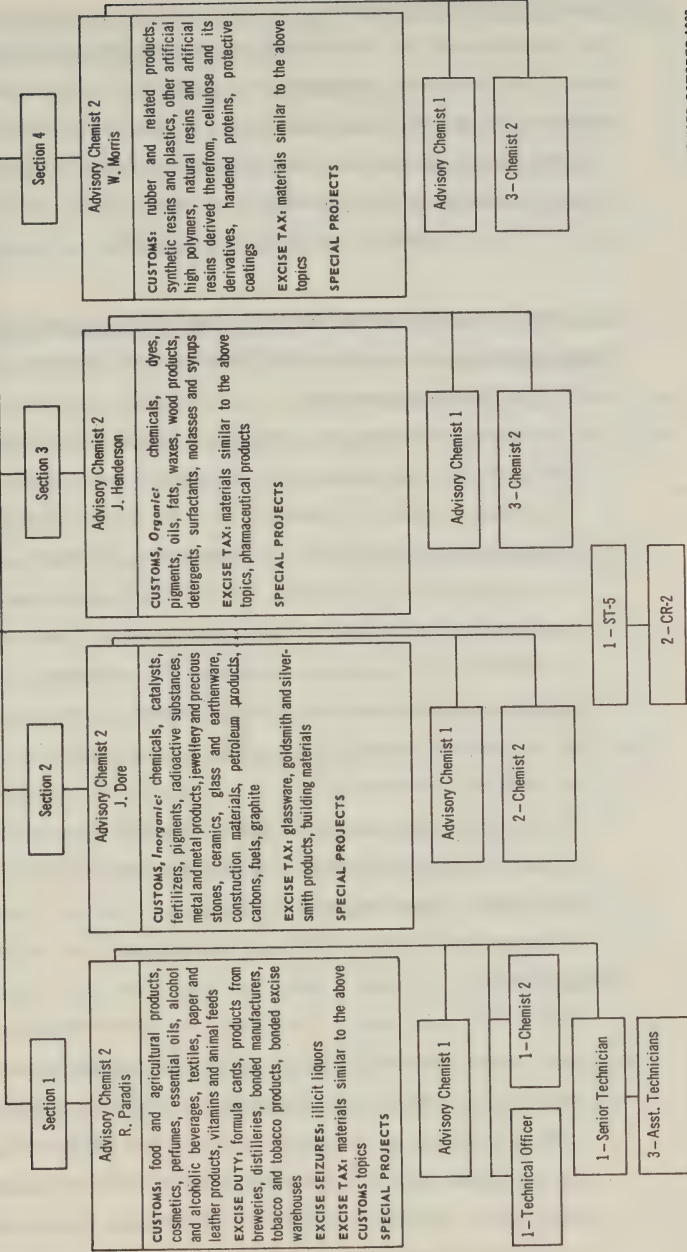
Today the Laboratory is a division of the Department's Financial and Management Services Branch. It is physically located at 490 Sussex Drive, No. 9 Temporary Building. An organizational chart of the Laboratory appears on the following page. This chart represents a reorganization which was implemented in July, 1967. The reorganization, in part, was due to the impending implementation of Tariff Board Report R-120.

LABORATORY DIVISION

DEPARTMENT OF NATIONAL REVENUE
CUSTOMS AND EXCISE

Director, Financial and
Management Services

Chief,
D.T. Mather



REVISED OCTOBER 1968

3. Organizational Functions

The function of the Laboratory is to examine and identify a variety of chemical commodities, in order to provide scientific information as to composition, use, etc., sufficient to permit classification in the Customs Tariff, or for the administration of any other Act of Parliament (i.e. Excise Act) within the ambit of the Department of National Revenue.

The organization's functions and responsibilities in relation to other agencies, etc., are briefly described below:-

(a) Other Federal Agencies

This is an advisory or consultative function in that professional information is supplied to any Federal Government agency requesting it. We advise officials of the Department of Industry, the Department of Trade and Commerce, the Department of Finance, the Dominion Bureau of Statistics, and the Tariff Board on questions arising from the scientific and administrative aspects related to the importation and exportation of chemical commodities

- by discussing verbally on a day-to-day basis,
- by writing memoranda,
- by meeting with representatives of producing or importing companies, both Canadian and foreign and with officials of Government agencies, and
- by undertaking fact-finding field trips.

(b) Industry

Scientific implications arising from Departmental rulings and Laboratory analysis are often discussed in meetings with representatives of manufacturing or importing firms. The topics considered at these meetings may fall into any area of our work, and it is common practice for the companies to send their technical experts to represent them. It is thus our task to represent and defend the Department's technical position in discussion with industrial representatives, each of whom is a specialist in the particular field under consideration.

(c) International Representation and the Monitoring of Scientific Activities Outside of Canada

We exchange and review ideas with our counterparts in the United States and with the Committee of Chemists, Customs Co-operation Council, Brussels. Laboratory facilities, equipment, etc. used by these two groups have also been examined by Laboratory chemists.

4. The operational effectiveness of any organization will depend, for the most part, on how well management plans, organizes, staffs, directs, co-ordinates, regulates, and budgets. Utilizing these management functions our process for reviewing and revising duties, goals, and operational effectiveness includes the following:

- Annual programme reviews: structure; personnel; procedures; budgets; etc.
- Employee records: turnover; absenteeism; tardiness; grievances; merit ratings
- Work and work flow: production bottlenecks; backlogs; records of waste and excessive errors; reports on satisfaction with our work
- Supervisory policy: chemists are advised of current decisions relating to their work; assigning of cases; receiving and reviewing all reports from the chemists and suggesting changes or further work as necessary; co-ordinating these reports with a view to establishment of guides
- Job knowledge: technical, administrative, and supervisory phases; on-the-job training; special courses, etc.; job application
- Morale factors
- Communications
- Management audits.

In the past, the major hindrances to the effective performance of our work have been a lack of:

- (a) scientific equipment
- (b) manpower
- (c) opportunities for advanced training, special courses, etc.

These obstacles to our technological progress have now been removed.

No major changes in organizational functions are probable during the next five years. The Laboratory was re-organized and streamlined in July of 1967.

5. Personnel Policies

In the area of recruitment, the Public Service Commission is responsible for the selection and placement of personnel. This process is shared with us. We work together as closely as possible to ensure that we are fully informed as to the sources of supply and that every effort is made to find qualified people and to bring them into the service. This is important in those professions which are in short supply. This is particularly true in our case as we like to recruit chemists with at least an honors degree. We inform the Commission in advance of our needs. This enables the Commission to make plans to secure the personnel we require, in the numbers we require, from university graduating classes. The initial steps of identifying and hiring the most effective researchers involve recruitment, selection (academic performance, experience, personal suitability) and placement.

Training, development, transfer, and promotion of personnel follows the selection process. Those with potentiality as researchers, administrators, or both are identified by a combination of factors which include the following:

- (a) formal qualifications
- (b) experience and training background
- (c) job knowledge of technical, administrative, and supervisory phases

- (d) leadership qualities
- (e) ability to communicate orally and in writing.

Staff members are encouraged to take courses offered by our Department or the Public Service Commission in such fields as supervision, public and basic administration, management, and languages. Extramural education in the form of approved university courses, special courses, etc., is also encouraged.

6. Personnel Associated with Scientific Activities

- (a) Current personnel establishment by category of personnel
 - 18 Chemists (professional)
 - 1 Technical Officer
 - 4 Technicians
 - 3 Clerical
- (b) One of the above professional staff devotes most of his time to administrative duties
- (c) Tabulated information regarding professional staff associated with scientific activities

Table I

	Pass BSC (8)	Honors BSC (8)	Master (2)
(i) Country of birth	4-Canada 1-Italy 1-England 1-Yugoslavia 1-Scotland	4-Canada 1-U.S. 1-Italy 1-China 1-Hungary	1-Canada 1-Pakistan
(ii) Country in which secondary education taken	7-Canada 1-Italy	8-Canada	1-Canada 1-Pakistan
(iii) Country in which University degree taken	7-Canada 1-Italy	8-Canada	2-Canada
(iv) (a) Number of working years since graduation (b) Number of years employed in present organization - for each individual	1)a)33 b)30 2)a)25 b)24 3)a)17 b)12 4)a)8 b)1 5)a)2 b)2 6)a)0 b)0 7)a)0 b)0 8)a)0 b)0	1)a)38 b)33 2)a)7 b)7 3)a)5 b)5 4)a)4 b)4 5)a)2 b)2 6)a)2 b)0 7)a)0 b)0 8)a)0 b)0	1)a)39 b)33 2)a)4 b)1
(v) Average Age	37	30	48
(vi) Percentage able to operate effectively in Canada's two official languages	13	25	0
(vii) Number of staff on education leave	0	0	0

Table II

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Total number of professional staff for each of the years 1962 to 1968 and estimates for each of the years 1969 to 1973	BSC Pass	7	6	4	4	5	6	8	8	8	8	8
	BSC HONORS	3	5	6	6	6	6	10	10	10	10	10
	Masters	1	1	1	1	1	2	2	2	2	2	2
	BSC Pass	28	33	0	0	0	17					
Percentage turnover of professional staff for each of the years 1962-1967	BSC Honors	0	0	0	17	0	17					
	Masters	0	0	0	0	0	0					
		0	0	0	0	0	0					
		0	0	0	0	0	0					
Number of university students given summer employment in the field of scientific activities for the years 1962-1967		0	0	0	0	0	0					

(d) The percentage of current professional personnel who, since graduation, have been employed

- (1) by industry is 35%
- (2) on the staff of universities is 6%
- (3) by provincial departments or agencies is 18%
and
- (4) by other Federal agencies is 35%.

7. Expenditures Associated with Scientific Activities

A break down of Laboratory funds into categories such as functions, scientific discipline, and areas of application is not available. No correlation exists between the above categories and the system used by our Department. Capital and operating expenditures, funds spent for training courses (administrative, technical, and supervisory) and funds expended to further professional university education are listed below.

Fiscal Year	1962-1963	1963-1964	1964-1965	1965-1966	1966-1967	1967-1968	1968-1969
Operating and capital funds (including salaries) - Total expenditures (thousands of dollars)	not available	not available	not available	not available	170	208	252
Funds spent for training courses (dollars)	not available	not available	425	650	720	1450	not available
Funds expended to further professional University education (dollars)	not available	not available	0	0	0	440	not available

Fiscal Year	1969-1970	1970-1971	1971-1972	1972-1973	1973-1974
Operating and capital funds (including salaries) - Total expenditures (thousands of dollars)	265	285	287	289	291

8. Intramural Research Activities

We are involved with programmes that are selected, initiated, and monitored either intramurally by the Department of National Revenue or extramurally by another Federal agency. The role played by the Laboratory through projects which support Federal programmes is quite obvious if one understands our organizational functions and responsibilities. Most projects which we complete are therefore selected by a Federal agency. However, some projects are initiated by the Laboratory. These projects, for the most part, involve research into analytical methods. The results facilitate the analysis of difficult chemical commodities. Examples of our participation in Federal programmes and projects are illustrated under "Projects".

Our function could be described as advisory. Priorities are therefore only meaningful when expressed in terms of projects which we initiate. All other projects must be completed within their terms of reference.

9. Research Output

Prior to 1962 many papers arising from research activities were published by members of the Customs-Excise Laboratory. These articles appeared in such journals as *Journal of the Society of Chemical Industry*, *Transactions of the Royal Society of Canada*, *Journal of the American Chemical Society*, *American Journal of Pharmacy*, *Industrial and Engineering Chemistry*, *The Analyst*, and *Chemistry in Canada*. The Laboratory, in recent years, has become involved in several large projects. Priority had to be given to these projects. Research activities initiated by us had to be very selective. The results of these activities remain, at this time, unpublished and are used to facilitate the work within the Laboratory. Many of these research activities involve new products where patents are pending and are quite confidential.

Reports, both intramural and extramural, have been issued by the professional staff of the Laboratory. Most of these reports are of the "day to day" type but many deal with applied research. Our work is non-routine and of a complex nature, therefore, no

attempt has been made to differentiate between either of the above categories. An approximate summary of the number of reports issued is listed below.

Year	1962	1963	1964	1965	1966	1967
Number of reports (in thousands)	5	5	4.5	5	4.5	4

Apart from using reports to transmit information, conferences are held with representatives of other departments or of industry to discuss problems, relative to the classification of imported goods, and to find a solution for them.

An average of fifty conferences a year have been held with representatives of industry for the period 1962 - 1967. An equal number of meetings over this same period, have been held with other federal agencies.

"Field trips" and attendance at meetings of professional societies are also used to collect and transfer information.

The impact of our scientific activities on Canadian economic development is illustrated and discussed under "Projects".

10. Projects

Examples of projects which were conducted during each of the years from 1962 to 1967 inclusive are listed below.

(a) 1962 - 1967

Tariff Board Report, TR-120

Our Laboratory has completed a series of projects in support of the above mentioned reference over the past six years. This report was ten years in preparation and recommends the introduction into the Customs Tariff of a completely new schedule for chemicals, chemical preparations, and plastics, and the elimination or modification of corresponding existing items.

(b) 1962

Butadiene content of Styrene-Butadiene Copolymers.

(c) 1963

Synthetic Elastomers and Notation of Acceptability within Rubber Definitions.

(d) 1964

(1) The Physical and Chemical Parameters Used to Determine the Difference Between First and Second Grade Cellophane.

- This was part of a programme established to determine if first grade Cellophane was being dumped on the Canadian market as second (reject) grade Cellophane.

(11) Proof Spirit - Sikes and Gay-Lussac Systems of Alcoholometry

- This project compared two systems used for the fiscal gauging of spirits. It was part of a programme initiated by our Excise Duty Branch.

(111) Production of Sodium Carboxymethyl Cellulose

- This project was part of a programme initiated by the Department to explain the low valuation of a Swedish product for Customs purposes.

(e) 1965

(1) The Classification of Polyethers

- This project was part of a programme set up by the Department to study the classification of those polyethers which are suitable for use in the manufacture of flexible polyurethane foams.

(11) Determination of Benzoyl Peroxide

- A method for determining the active content of benzoyl peroxide was required for Made-in-Canada Purposes.

(f) 1966

(1) Chemical Substances which Are Used to Impart Wrinkle-Resistant Properties (Permanent Press) to Textiles.

(11) Acrylonitrile content of Styrene-Acrylonitrile Copolymers.

(g) 1967

(i) PVC content of ABS-PVC Blends.

(ii) Preparation of Fatty Acid Methyl Esters for GLC Analysis.

10.1 Case histories of what we consider to be our most significant completed projects of the last five years are discussed below. They are presented, as requested, under the two broad categories of "applied research" and "development" since no projects involving "basic research" have been undertaken.

(A) Applied Research

(i) Butadiene Content of Styrene-Butadiene Copolymers

The percent by weight of styrene or butadiene can be determined by infrared spectroscopy. This determination must be made by the Customs-Excise Laboratory since those copolymers with a butadiene content of more than 50 percent by weight are classified as synthetic rubber. A fast reliable method independent of most other constituents and impurities was developed.

(ii) Acrylonitrile Content of Styrene-Acrylonitrile Copolymers

The percent by weight of acrylonitrile or styrene can be determined by infrared spectroscopy. Most commercially available SAN copolymers are composed of approximately 76 parts styrene and 24 parts acrylonitrile or minor variations thereof. A method of expressing acrylonitrile in terms of styrene is required in order to facilitate the analysis of ABS in polymer blends, etc. A relatively consistent relationship was obtained even though the nitrile band departs from Lambert's Law. The results obtained will resolve those polymers with an acrylonitrile content of up to 40%. This is satisfactory for the analysis of most commercial polymers which contain it.

(iii) Identification of Vegetable Oils

The Customs Tariff contains thirty-six tariff items dealing with various vegetable oils with rates of duty varying from free to 25%. Distinguishing between these oils posed a difficult analytical problem for the Laboratory. Several methods involving gas chromatographic analysis of the naturally occurring triglycerides, the liberated fatty acids, and the synthesized methyl esters had been reported. Research conducted in the Laboratory with known samples showed chromatographic analysis of the triglycerides to be difficult and of limited value. Chromatographic separation and quantitative analysis of the methyl esters gave good results. However, the methylating procedure using conc. sulfuric acid in methanol produced an undesirable side reaction between the sulfuric acid and any unsaturated fatty acids present.

A methylating procedure using perchloric acid in methanol gave complete methylation of fatty acids in five minutes with no undesirable side reactions. Methyl ester standards of vegetable oils were then prepared for future reference.

(iv) Determination of Ethyl and Methyl Alcohol in Mixtures with other Materials

It is necessary for Custom purposes to quantitatively determine ethyl and methyl alcohol in mixtures with other materials. This presented a difficult problem with samples having complex solvent systems, including low molecular weight ketones, esters and hydrocarbons which were difficult to separate from the alcohols. Experiments with new solid supports and liquid phase packings were carried out. A column and a set of operating conditions were developed to solve this particular problem.

(v) PVC Content of ABS-PVC Blends

This information is required to permit classification in the Customs Tariff of moulding compounds and sheet materials and is very important as the predominant resin determines the classification and thus the rate of duty applicable. An infrared spectroscopic method utilizing some of the information obtained in (A)(i) and (ii) above was coordinated with new data. Compounding ingredients, with the exception of plasticizers were not removed. The method developed is fast and reliable.

(B) Development

(1) Tariff Board Report TR-120

Our inadequate chemical tariff structure is one of the main reasons for Reference 120. The basic structure of the present chemical tariff has not changed since it was established in 1906. Many of the chemical and allied group tariff items are outmoded due to changing times and rapid technological advances. These tariff items contain anomalies, inconsistencies, obsolete wording, and difficult to administer "Class or Kind" items.

It was quite evident that changes had to be made. With this in mind interested associations, commissions, etc., approached the Department of Finance. The main aims of their proposals were to provide Canada with a consistent, modern, reliable, chemical tariff that would promote and protect manufacturing in Canada.

The Minister of Finance, in September 1956, decided that it was desirable to refer to the Tariff Board a section of the Canadian Customs Tariff relating to chemicals. This reference was to cover various tariff and drawback items which relate generally to basic industrial chemicals, coal tar products, dyes, pigments, paints, industrial alcohols, fertilizers, insecticides, fungicides, explosives, miscellaneous preparations, and chemicals

Special Committee

for producing soaps, detergents, and rubber. The Board was directed to study and provide a revised schedule with rates if amendments to the Customs Tariff were desirable. The scope of Reference 120 has been widened several times since 1956 to include items covering synthetic resins and plastics, etc.

The Tariff Board decided to use the headings of the Brussels Nomenclature, as proposed by the Industry Committee early in 1960, for scheduling the public hearings which took place in May of 1960. Members of our staff were present at these hearings. After the final submissions were heard by the Board in June of 1963, the enormous task of preparing a report and new schedule began. The hearings had produced some 28,500 pages of stenographic transcript. Over 1200 submissions were filed on behalf of 370 interested parties to deal with the more than 200 chemical tariff items.

Our role in the development of Reference 120 is as wide in scope as the Reference itself. A chemist on our staff was a full member of the Rules and Notes Committee established for the adaptation of the Interpretative Rules, Chapter Notes and Explanatory Notes of Brussels Tariff Nomenclature for Canadian use, and for the wording of new notes where none exist. This was necessary to facilitate the implementation and administration of the Recommended Schedule of Tariff Board Report TR-120, Vol. 1, thus giving effect to Canada's part in the Kennedy Round Negotiations, as it affects chemical and related products. It will be appreciated that Notes, such as are under discussion, are virtually unknown in the existing Customs Tariff; hence, our work in this area may be regarded as a pioneer effort for Canada.

The Laboratory contributed many projects to the over-all development of this programme. A description of each is beyond the scope of this brief. For illustrative purposes, an outline of a project has been listed below.

EXAMPLE

The Tariff Board Report directs that the Notes for the Recommended Schedule shall conform "as nearly as may be" with the Brussels system. The Recommended Schedule of that Report provides for organic surface active agents under Recommended Item 34.02, and for polyethers under Recommended Item 39.01(a)8. Certain polyethers, such as the ethylene oxide-propylene oxide block copolymers, are also organic surface active agents. The Compendium indicates that, in the Brussels system, such polyethers are to be classified in Heading 34.02 and not in Heading 39.01. The draft Canadian Notes have been written to reflect this view.

A thorough understanding of the chemistry of polymers and surfactants was required to complete the above project as well as a knowledge of the following:

- Tariff Board Report, R-120, Chemicals
- Brussels Tariff Nomenclature with Section and Chapter Notes
- Brussels Tariff Nomenclature, Explanatory Notes
- Compendium of Classification Opinions of Customs Co-operation Council, Brussels.

Our projects have explained to the non-chemists involved in this massive programme the chemistry involved in the Recommended Schedule, the effect of the Notes and Rules, and the relationship between the existing Schedule and the Recommended Schedule.

NOTE: The Brussels Nomenclature consists of approximately 1096 well defined category headings for classifying all goods in commerce along with explicit rules and explanations for the interpretation of the classification. The arrangement of chemicals is based on a combination of established scientific and commercial groupings recognized generally in world trade. This flexible, periodically updated system is used by over 80 countries.

(11) Tariff Classification of Polyethers

A dispute arose involving the Department and several companies regarding the correct classification of those polyethers which are suitable for use in the manufacture of flexible polyurethane foams, a material currently of great importance in the furniture and automobile body industries.

The following are possible classifications for such materials:

	<u>Tariff Item</u>	<u>Rate</u>
Chemicals, not made	20839-1	(0% BP, 15% MFN)
Chemicals, made	71100-1	(15% BP, 20% MFN)
Synthetic Resins, other type	90109-1	(0% BP, 0% MFN)

The dispute was precipitated when Company A started manufacture of those materials in Canada, and obtained a "Made in Canada" ruling which covered them. As a result, Company B, which was both a manufacturer of polyurethane foams and an importer of some of the polyethers involved, was faced with an increase of duty from 15% to 20%. This company then claimed the materials it imported to be "synthetic resins" and not "chemicals", and, therefore, dutiable at 0%, and unaffected by the "Made in Canada" ruling, thus challenging a Department ruling of long standing.

In an attempt to resolve this difficulty, a study, in depth, of the problems of "liquid resins" was initiated with the objective being the development of a consistent Customs classification for liquid polymers. This involved a review of the tariff treatment accorded not only to the polyethers, but to other liquid resins and polymers, including conventional epoxies, cycloaliphatic epoxies, hydroxyl terminated polyesters, other liquid polyesters, liquid polystyrene, liquid polyacrylates, etc. Technical literature and submissions from interested companies were carefully studied. In addition, a trip was made to Washington to consult with the appropriate sub-committee of the ASTM. Our trip caused this Committee to abolish its published definition of "liquid resins". This removed the main prop of Company B's case, and strengthened the Department's ultimate decision. As a result of this project a complete report was made to the Assistant Director, Appraisers Branch with final decision by the Director.

(iii) Cellophane - First or Reject Grade

Universal standards governing the grading of cellulose film do not exist. Instead, each manufacturer has his own set of specifications which are changed and adjusted from time to time. Some factors which help to determine specifications are buyers, competitors, and competition from other film types.

There are two different kinds of buyers for first grade Cellophane. "Direct users", such as bread manufacturers, are not as critical as "converters" and will tolerate certain minor defects such as loose and telescoped rolls. "Converters", such as bag manufacturers, printers, etc., demand a high quality film free of defects. Company A and Company B, both manufacturers of Cellophane in Canada, felt that first grade Cellophane was being imported as second or reject grade Cellophane.

This Cellophane was being sold to "direct users" but not to "converters" as the latter require technical services along with a high quality cellulose film. A set of physical and chemical parameters was required to differentiate between first and reject grade Cellophane. It became quite obvious, after trips to plant sites, that many chemical and physical tests are "not used for control" and are therefore not used to grade the film. A tedious study, which recognized the effects of moisture and repeated handling, produced a set of specifications. A complete report was made to the Director, Appraisers Branch.

(iv) Classification of "Permanent Press" Chemicals

Chemical substances which are used to impart wrinkle-resistant properties to textiles could fall into one of the following categories:-

- (a) single chemical
- (b) mixture of chemicals
- (c) aqueous solutions of synthetic resins
- (d) chemicals which form synthetic resins on the fabric
- (e) compositions of synthetic resins.

A project was initiated to study this entire question. The substances themselves were analyzed, current technical literature and company information was reviewed, and a number of meetings with representatives of companies interested, both domestic and foreign, were held. Conclusions were then drawn as to the kind of reaction the chemical substances involved were capable of undergoing. A classification system was developed.

In the light of the above, it was decided that condensation products of formaldehyde with urea, or with melamine, were in either (c) (Free/Free) or (d) (Free/Free) depending on the state of advancement of the reaction, or (e) (15%/15%) if precatalyzed or otherwise compounded, while other substances, such as substituted imidazolidines, substituted perhydropyrimidines, and methylolated carbamates fall into

(a) (Free/15%) or, if catalyzed, into (b) (15%/20%).

The companies involved contended that all the materials fall into (c) or (d). All that part of the Canadian textile industry whose interests include permanent press fabrics is affected by the above project.

PART B

POSSIBLE IMPROVEMENTS DUE TO TECHNICAL DEVELOPMENTS
AND THE TYPE OF TECHNICAL ADVICE SOUGHT IN THE PAST1. Electronic Data Processing

In the past the use of electronic data processing for various Customs and Excise activities has been examined. Although no overall plan has as yet developed, electronic data processing continues to be regarded as a means of assistance for promoting increased efficiency in the department's operations.

Recently, an outside firm of management consultants has been employed to make a study of the electronic data processing potential of the department. The purpose of the study is to obtain guidance as to the most desirable course to be followed by the department in developing the use of electronic data processing for its operations. The study is to extend to all functional and operating units and will include the consideration of applications currently in effect and those which will be required in the future. Under the consulting firm's terms of reference, there is to be a review of all activities with an evaluation made for purposes of assessing those areas which lend themselves to electronic data processing applications. In making the assessments, essential factors for consideration include cost benefits, improved quantity or quality of service and assistance in the field of general departmental management.

Priorities are to be assigned by the management consultants when preparing the planning and development programs for the department. The priorities and the planning schedules proposed are to ensure that there can be a maximum integration of the processing systems initially developed and that these will provide a sound basis for expansion and the integration of subsequent applications.

The final report of the management consultants is to set forth a program for the next five years. This report is to be submitted to the department late in 1968.

2. Types and Sources of Advice Sought

Technical advice from sources outside the department is essential, in many instances, in order that departmental officers may render decisions which are based on a full knowledge of the factors involved. Expert technical advice is also required in connection with cases which are appealed to the Tariff Board and, in some instances, taken in turn to the Exchequer Court of Canada and the Supreme Court of Canada.

In addition to working in close liaison with the staff of the Customs and Excise Laboratory, ruling officers seek advice from government agencies, various associations and individual manufacturers and producers. The types of advice which they have sought, within the past five years, fall within the following general categories:

- (a) Specifications of and the operating features of equipment such as machines, electrical goods and precision instruments;
- (b) Manufacturing processes by which materials and articles are fabricated;
- (c) Comparisons of quality and other characteristics of materials and articles;
- (d) The composition and nature of materials and articles.

Sources from which technical advice has been obtained are given on the following page.

SOURCES OF TECHNICAL ADVICEGOVERNMENT DEPARTMENTS AND AGENCIES

Department of Agriculture
Canadian Broadcasting Corporation
Department of Defence Production
Dominion Coal Board
Department of Energy, Mines and Resources
Department of Fisheries
Department of Forestry and Rural Development
Department of Industry
Department of National Defence
National Film Board
Department of National Health and Welfare
National Research Council
Department of Transport

OTHERS

American Textile Manufacturers' Institute (USA)
Canadian Electrical Manufacturers' Association
Canadian Food Processors Association
Canadian Horticultural Council
Canadian Machine Builders' Association
Canadian Petroleum Association
Canadian Refrigeration Manufacturers' Association
Canadian Textile Institute
Canadian Tooling Manufacturers' Association
Fabric Research Institute (USA)
Graphic Arts Industries Association
Hain's Research Laboratories Inc. (USA)
Individual manufacturers and producers

PART C

RESEARCH IN THE EXCISE TAX BRANCH

1. General Comment

We have an Excise Tax Research and Development Division whose task is to plan measures to improve:

- a) the administrative feasibility (i.e., in terms of certainty, simplicity, effectiveness and cost of administration and compliance) and,
- b) the economic neutrality,

of the Excise Tax Act and the various administrative instructions (i.e., tax regulations, circulars, bulletins) that are issued by the Department of National Revenue under this Act.

When these measures require amendments to the Excise Tax Act, they are forwarded to the Department of Finance for its approval and possible introduction into the legislative process.

Sometimes a study by this Division originates with a request from the Department of Finance to develop a possible amendment to the law which stems in turn from fiscal or tax policy objectives. On the other hand, a study may originate within the Excise Tax Branch, but it may have fiscal or tax policy ramifications that must be discussed with Finance.

In addition to tax (sales and excise) structure planning and research described above, the Audit Division and Collections Section in Ottawa are involved in research and planning activities with the principal goal of improving the operational efficiency of the audit and collections operations in the field offices across the country (e.g., audit work measurement and work organization).

2.1 Organization

The organizational chart of the Excise Tax Branch is shown as Appendix "A".

The organizational chart of the Excise Tax Research and Development Division is shown as Appendix "B".

2.2 Organizational Functions

The Research and Development Division is two years old. It is still in the process of defining the scope of its responsibilities, particularly in drawing a demarcation line between work that should be done by operational units, and work that should be done by the Research and Development Division.

Objectives are set annually, and agreed with senior management. Typically, the setting of objectives is essentially one of setting priorities for the large backlog of projects that await research and planning. Requests from the Department of Finance and projects related to operational crises receive first priority.

2.3 Personnel Policies

At the senior researcher level, our practice is to use experienced tax administrators who are then trained to be tax researchers and planners. At the research assistant level, we select university graduates in commerce or economics, and teach them tax administration policy and tax research.

Our organization is too small to justify research administrators, and the director of the division is a combined administrator and senior researcher.

The virtual absence of formal educational courses on commodity tax administration forces us to rely on a combination of acquired or internally developed tax administration knowledge and developed research ability.

The classification guidelines used in the Public Service discriminate against officers engaged in this work. They are classified as programme administrators, and suffer from the classification emphasis on "responsibility for contacts" and "supervision".

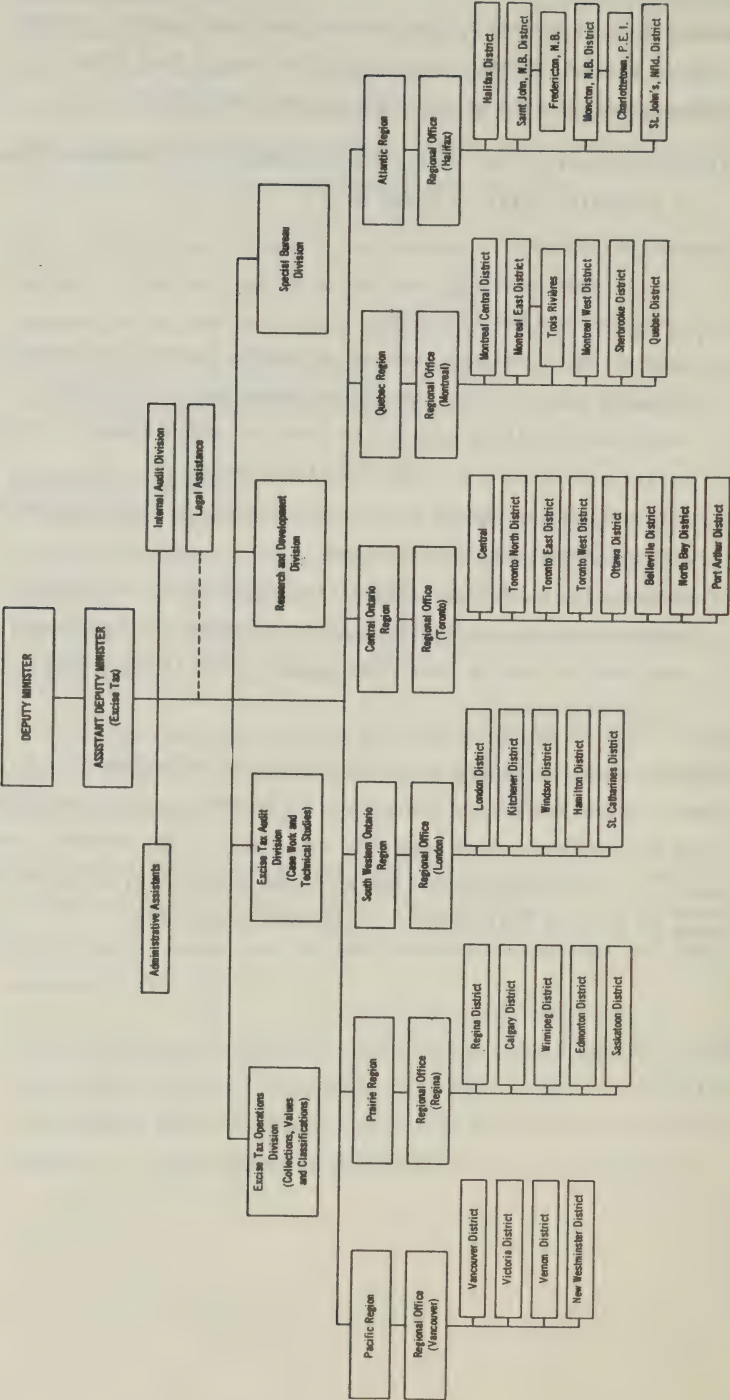
2.8 Research Output

Research and planning by the Research and Development Division is in a narrow, specialized field. The sample list below illustrates the kind of projects we are involved in.

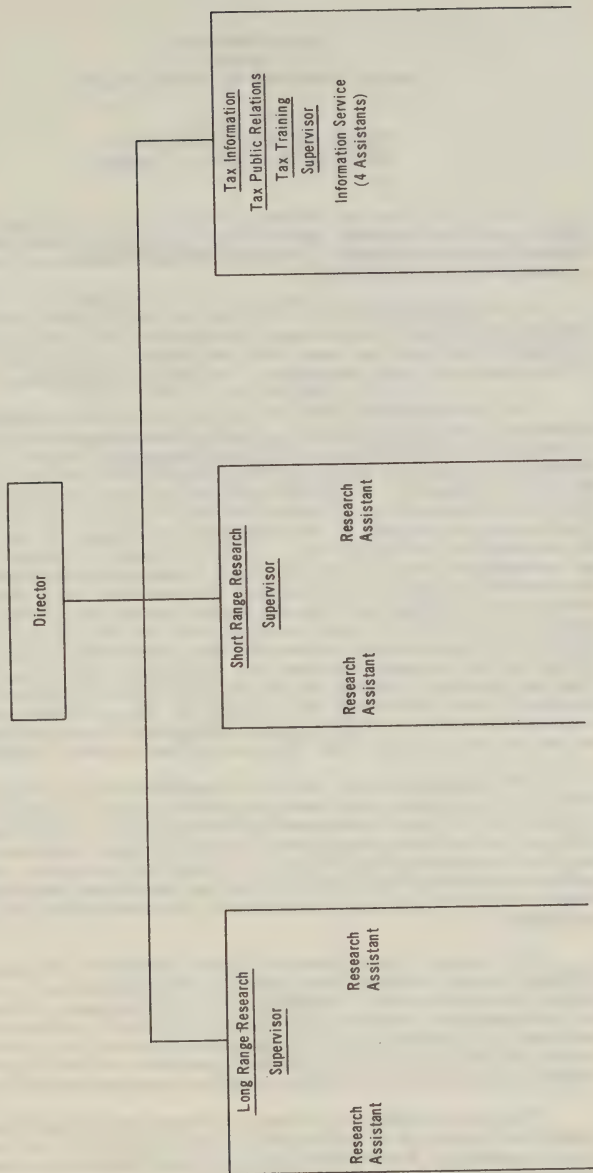
- 1) Implications of the Carter Royal Commission's recommendations on commodity taxes in terms of:
 - a) tax scope;
 - b) taxable value;
 - c) organization structure.
- 2) Alternative forms or schedules of excise burdens on tobacco products and alcoholic beverages (assuming total revenue needs are fixed), evaluated in terms of administrative feasibility and inter and intra industry competition.
- 3) Alternative approaches to giving sales tax relief to housing and other building construction.
- 4) Alternative methods of taxing tire retreaders (an industry which generates considerable administrative and compliance complexities and in which the typical firm is small and unsophisticated).

The end result of these projects may be the achievement of a fiscal objective of the Department of Finance, or the resolving of a tax administration problem, in a manner that attains a good measure of administrative certainty and simplicity, or effectiveness of revenue collection, or economic neutrality.

APPENDIX "A"
Part C



ORGANIZATION CHART
EXCISE TAX RESEARCH AND DEVELOPMENT DIVISION



Special Committee

APPENDIX 46

BRIEF SUBMITTED
to the
SPECIAL COMMITTEE ON SCIENCE POLICY
by
BRYDON SMITH
CURATOR OF CONTEMPORARY ART,
THE NATIONAL GALLERY OF CANADA

1. This brief does not include an account and projection of the activities of the National Conservation Research Laboratory at The National Gallery of Canada. Dr Nathan Stolow, Director of the N.C.R.L., is submitting a separate brief.
2. My immediate concern is with the interrelationship between some contemporary artists' visions and the potential of science and technology to realize them, and the human value and meaning some artists can give to the impersonalizing tendencies of science and technology.
3. Two organizations which are currently a forum for artists, scientists, and engineers are the Canada Council sponsored Intermedia in Vancouver and Experiments in Art and Technology (E.A.T.), a private foundation in New York City, with branches in other cities including Montreal and Toronto. As yet the projects realized by these organizations have been disappointing. I think that this is partly due to their having limited their activities to the momentary intercourse of art and technology in the guise of art exhibitions. If a confluence of art and technology is to be meaningful now, it must go beyond occasional entertainment programmes confined to art galleries. This does not mean the facile application of so-called art objects to urban and natural spaces, but rather the imaginative human transformation of those areas in which we live, work, travel, and play. It is encouraging to know that more architects, planners, and social scientists are becoming involved with Intermedia. This could mean a shift from the creation of things for the art market place to the larger re-ordering of our environment and patterns of life. Art galleries could take an active role in this proposed realignment of art and technology, as long as they did not limit these activities to their institutions.
4. Two American artists who are independently using available technology to humanize and beautify existing spaces are Robert Morris and Dan Flavin. Morris proposes the construction of earth forms covered with sod and left for natural use. Flavin proposes arrangements of ordinary fluorescent light fixtures to transform interiors. Both artists work within the limits of existing spaces and technologies; each shows a different successful solution for integrating art into the environment.
5. The supposed creative use of digital computers and microfilm plotters to make pictures is an insult to man and computer, at a time when we are getting rid of ownership, substituting use. (Of course this does not mean that computers will replace artists.) Artists can use computers in a recreational and non-productive way (i.e. no end product) in art exhibitions to control physical processes as they happen; at present this is more costly than exhibiting computer droppings.
6. The use of computers for the art historical research and public educational functions of the Gallery is being studied by our librarians. When in operation, information about art would be available when and where needed throughout a system comprising museums, galleries, universities, archives, and libraries.

APPENDIX 47

BRIEF FOR SPECIAL SENATE
COMMITTEE ON SCIENCE POLICY
BY THE
ROYAL CANADIAN MOUNTED POLICE
CRIME DETECTION LABORATORIES
OTTAWA, ONTARIO

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I. Preface -

1. The Crime Detection Laboratories, a Branch of the Royal Canadian Mounted Police, exist as part of a National Police Service to provide scientific and technical assistance to Canadian police forces and enforcement agencies at the Federal, Provincial, and Municipal levels in relation to criminal investigation and security matters. Although these laboratories are primarily service-oriented rather than research-oriented, there is an urgent need for continuous research and development work in the forensic sciences.

2. Because the forensic sciences do not constitute a single discipline but include any of the physical and biological sciences which may be applied to help ascertain the true facts in the course of police investigations, the problem of developing a balanced research and development program becomes cumbersome to coordinate. It requires direction by competent research scientists who are fully knowledgeable in not only the basic scientific disciplines to which they belong, but also, in the applications of their disciplines to the law and the inherent and often unique problems associated with analyses of materials of forensic value in criminal investigations. For instance, the techniques employed in grouping dried blood stains on clothing are completely different from those used in clinical laboratories wherein the analyst has the advantage of using fresh blood with intact cells for grouping tests. The nature and condition of materials received for forensic analyses are often such that normal analytical procedures carried out in industrial, clinical, and other laboratories are not applicable. Also, some examinations such as those pertaining to firearms and tool marks are not carried out at all in other than forensic laboratories. Hence, forensic examinations are often of a highly specialized nature and are, at present, learned through in-service training and experience upon employment at the forensic laboratory.

3. Courses in the forensic sciences are not taught in Canadian universities. It, therefore, becomes necessary to provide longer periods of in-service training to new incumbents, be they at the technician level or the Ph.D. professional level, than would otherwise be necessary. Very rarely does a student set out to become a forensic scientist. It has usually been through chance that a person has "drifted" over to this specialized field. Such a situation is not desirable, and because the freedom or imprisonment of an accused person may, at times, depend on the results of chemical or other analyses, it is imperative that personnel of high calibre be employed to staff forensic laboratories. Because there is a scarcity of well qualified scientists who become attracted to this field, it is exceedingly difficult to adequately staff the forensic laboratories situated across Canada in order to meet the quickly increasing demand for forensic laboratory services.

4. It must be emphasized that the role of the forensic scientist is not that of merely providing routine analytical data, but involves the additional complex functions of evaluation, comparison and interpretation of this data before the Courts in an objective and impartial manner to ensure that the true facts are revealed, leading to a just enforcement of the law.

5. The establishment of an Associate Committee of the National Research Council of Canada is recommended to advise the Commissioner, Royal Canadian Mounted Police, and through him, other interested Canadian police departments, police associations and forensic laboratories, on the scientific aspects of research for the police service including forensic sciences. An N.R.C. Associate Committee on Forensic Science and Police Equipment could function in much the same manner as the Home Office Scientific Advisory Council which was set up in the United Kingdom in the autumn of 1965 by the Secretary of State for the Home Department. Members of the Council are drawn from

academic and industrial fields and are representative of a wide range of scientific disciplines; they are, therefore, collectively equipped to take an embracing view of the problems of police research. As a council, they consider the projects in hand and subject them to careful analysis, sometimes suggesting a fresh approach or an improvement of methodology; they do not undertake projects although, on occasions, individual members are able to furnish assistance out of the scientific resources at their command or which they are able to influence. The Council meets, on an average, four times a year, but its two committees, one for police equipment and the other for forensic science, meet more frequently to consider projects in detail.

6. The establishment of a high-level Central Research Establishment within the R.C.M. Police Headquarters organization at Ottawa, as a part of the existing National Police Services is recommended to conduct research and development work in the field of forensic science and police equipment. This again is based on a similar step which was taken in the United Kingdom at the beginning of 1967 at which time a Central Research Establishment at Aldermaston was set up by the Home Office. The establishment of this research group in the U.K. is already universally recognized as a very important advancement in the field of forensic science research.

7. Up to now, the R.C.M.P. Crime Detection Laboratories have been almost exclusively functional police laboratories. The limited research which has taken place to date has been in connection with immediate case-work problems and, in the main, operational funds have been used. This is not a satisfactory situation and when trends in other scientific disciplines are noted, it becomes apparent that specific funds for research and development projects in the forensic science field are essential. If, therefore, we in the R.C.M.P. are to expand our functions to include those recommended in this brief, we must provide our scientists with compensation related to professional performance

and brought into line with salary scales of scientists doing research and development work in other agencies of Government. Additionally, as expressed in the Glasco Commission on Government Organization under the heading of "Professional and Scientific Personnel":-

"...It (the government) should offer challenging and rewarding work in environments fully compatible with professional values. Outside contacts need to be encouraged and supported, as well as opportunities to obtain scholarly recognition by publication and similar means..."

8. Because of the difficulty in getting trained forensic scientists, we are forced to the conclusion that Federal Government assistance in some form should be available to one or two universities for the purpose of graduating forensic scientists who will be available to work in Canada. Support of research work and graduate students at the universities might come, primarily, from sources such as the Medical Research Council of Canada and the National Research Council of Canada.

9. One or two Canadian universities should be encouraged, therefore, to establish, within their faculties of Medicine or Science, departments of forensic medicine and forensic science at the graduate level leading to M.Sc. and Ph.D. degrees in such specialized disciplines as forensic toxicology, forensic pathology, forensic immunology, forensic chemistry and other forensic sciences. Establishment of such graduate school departments within the Ottawa area, for example, near the Central Research Establishment proposed above, would provide for co-authorship, on the part of scientists of both establishments, of research works and publications, exchange of lecturers on specialized topics and other obvious mutual benefits. This latter co-operative arrangement would only be feasible, however, if the proposed Central Research Establishment became a reality. It would not be possible, for example, to impose this arrangement on our present set-up. Hence there is a very close inter-relationship between our recommendations for establishment of a Central

Research Establishment and university graduate schools in forensic sciences.

10. In summary, future scientific policy in the forensic sciences should include provision for the following:-

- a) the establishment of an Associate Committee of the National Research Council of Canada on Forensic Science and Police Equipment;
- b) the establishment of a high-level Central Research Establishment within the R.C.M. Police Headquarters organization at Ottawa as part of the existing National Police Services; and
- c) the establishment of Departments of Forensic Medicine and Forensic Science within one or two Canadian universities to provide post-graduate programs leading to M.Sc. and Ph.D. degrees in such specialized disciplines as forensic toxicology, forensic pathology, forensic immunology, forensic chemistry and other forensic sciences.

11. If it is agreed that the above provisions are necessary and that the R.C.M. Police Crime Detection Laboratories should participate in these programs -- expanding beyond their present basic police laboratory functions -- the Force would have no objection, in principle, to such increased participation. This would require that the R.C.M.P. Laboratories play, both nationally and internationally, a much more prominent role in the scientific community, particularly the forensic sciences' community, in conducting research and development work in the forensic sciences and in cooperating with academic institutions to provide a source of trained forensic scientists. It would only be possible, therefore, if, apart from provisions for the normal growth of their present operations, the R.C.M.P. Crime Detection Laboratories were supplied, on a high priority basis, additional financial resources with which to provide for the expansion in manpower, equipment and functions that would be required.

II. Introduction -

1. The Crime Detection Laboratories exist as part of a National Police Service to provide scientific and technical assistance to Canadian police forces and enforcement agencies at the Federal, Provincial and Municipal levels in relation to criminal investigation and security matters. They provide "expert" testimony in all criminal courts on evidential materials submitted to them and undertake

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limited research and development work in specialized areas of forensic science which is not conducted by other laboratories. They provide training in all areas of forensic science operations to members of Canadian police forces and enforcement agencies of other government departments and to representatives of police departments from other countries under External Aid and similar programs.

2. In order to deal effectively and efficiently with materials submitted for examination and evaluation, the operations of the five laboratories located at Sackville, New Brunswick; Ottawa, Ontario; Regina, Saskatchewan; Edmonton, Alberta; and Vancouver, British Columbia, have been grouped into the following Sections:

- Administration Section
- Chemistry Section
- Toxicology Section
- Serology Section
- Hair & Fibre Section
- Firearms & Tool Marks Section
- Questioned Documents Section
- Alcohol Section
- Photographic Section.

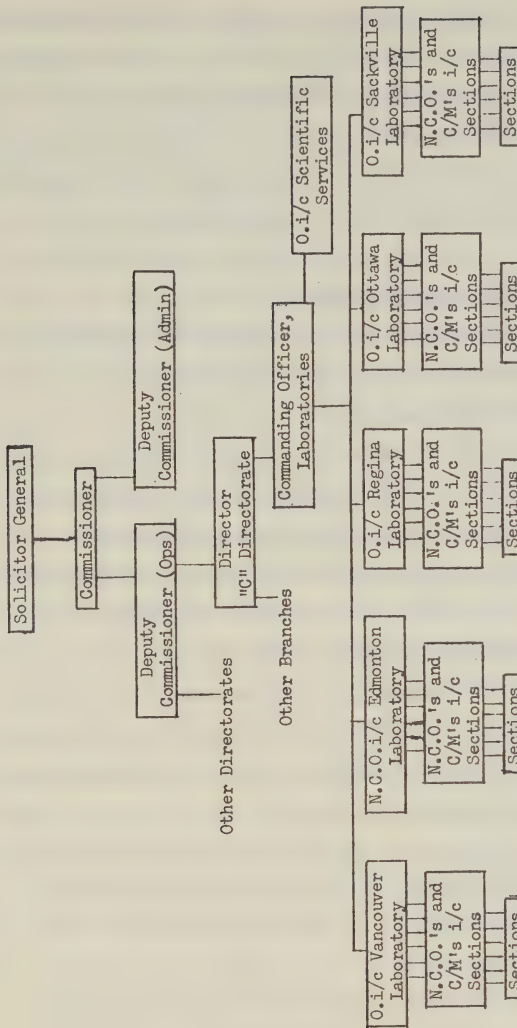
In addition, the Ottawa Laboratory has two special sections which function on a nation-wide basis. These are:

- The Central Bureau for Counterfeits
- The Special Services Section.

In the current year, the five laboratories have a total establishment of 138 persons.

III. Organization -

1. The Crime Detection Laboratories, under the command of a Central Commanding Officer, who is the senior scientific officer, is a Branch of the R.C.M.P. "C" Directorate under the command of the Director of Criminal Investigations (D.C.I.). The D.C.I. is, in turn, responsible to the Deputy Commissioner (Operations), and he takes direction from the Commissioner. The Commissioner is, of course, responsible to the Minister, the Solicitor General. The following partial organizational chart illustrates the chain of responsibility and command:



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2. No formal agreement exists regarding scientific activities between the R.C.M. Police and organizations outside of Canada except limited criminalistic training of foreign personnel associated with police organizations, through the External Aid office. The R.C.M.P. has no overseas offices dealing primarily with scientific affairs.

IV. Organizational Functions -

1. The general duties of the Royal Canadian Mounted Police have been set forth under Section 18 of the R.C.M. Police Act as follows:

"It is the duty of members of the force who are peace officers, subject to the orders of the Commissioner,

- a) to perform all duties that are assigned to peace officers in relation to the preservation of the peace, the prevention of crime, and of offences against the laws of Canada and the laws in force in any province in which they may be employed, and the apprehension of criminals and offenders and others who may be lawfully taken into custody;
- b) to execute all warrants, and perform all duties and services in relation thereto, that may, under this Act or the laws of Canada or the laws in force in any province, be lawfully executed and performed by peace officers;
- c) to perform all duties that may be lawfully performed by peace officers in relation to the escort and conveyance of convicts and other persons in custody to or from any courts, places of punishment or confinement, asylums or other places; and,
- d) to perform such other duties and functions as are prescribed by the Governor in Council or the Commissioner."

Moreover, Section 44 of the Regulations under the R.C.M. Police Act states:

"In addition to the duties prescribed by the Act, it is the duty of the force

- a) to enforce such laws made by or under authority of the Parliament of Canada and to render such assistance to departments of the Government of Canada, as the Minister may direct;
- b) to maintain law and order in the Yukon Territory and the Northwest Territories and in such national parks and other areas as the Minister may designate;
- c) to maintain law and order in those provinces and municipalities with which the Minister has entered into an agreement under Section 20 of the Act and to carry out such other duties as may be specified in those arrangements;
- d) to guard and protect such buildings, installations, dockyards and other property of Her Majesty in right of Canada as the Minister may designate; and,
- e) to maintain and operate such security and intelligence services as may be required by the Minister."

2. The work of the R.C.M.P., resulting from the above responsibilities, may be considered under the following eleven headings:

- Departmental Administration
- Divisional Administration
- General Detachment Policing
- Municipal Policing
- Highway Patrol
- Federal Law Enforcement
- Training
- National Police Services
- Police Services for Other Federal Departments
- Air Services
- Marine Services

3. National Police Services embrace the operation of the Identification Branch and the Crime Detection Laboratories. The Identification Branch is primarily a central repository of criminal records and information. Its main function is the identification of criminals by their fingerprints for all law enforcement agencies in Canada. The Crime Detection Laboratories consist of the operation of five R.C.M. Police Laboratories at Sackville, N.B.; Ottawa, Ontario; Regina, Sask.; Edmonton, Alberta; and Vancouver, B.C. Their prime objective is to develop and apply scientific methods to crime detection and, to some extent, national security.

4. As one of a number of branches within the R.C.M.P., the Crime Detection Laboratories estimate for establishment positions and funds in the same manner as other branches. The allotments requested for the various branches may be altered through executive decisions within the R.C.M. Police, and if cuts are necessary, then the C.D. Laboratories must attempt to manage with reduced funds and establishment positions as do any of the other branches. In general, it seems fair to state the policy of the R.C.M. police regarding its science "arm", the Crime Detection Laboratories, is that the Laboratories are maintained to provide a support service for its main task of law enforcement and, as such, the Laboratories constitute only one of several branches. As a National Police Service, however, many law enforcement agencies other than the R.C.M. Police depend on the C.D. Laboratories for scientific support service.

5. Although participation has been on a very small scale with respect to international representation at forensic conferences, the C.D. Laboratories have been able to send representatives to annual conferences of the American Academy of Forensic Sciences and the American Society of Questioned Documents. Abroad, in 1966, two representatives attended and presented papers at the Fourth International Meeting in Forensic

Immunology, Medicine, Pathology and Toxicology at Copenhagen, Denmark, and the Second Congress International Association for Accident and Traffic Medicine at Stockholm, Sweden. In 1963, a representative presented a paper on the Scientific Aspects of Police Work at the Interpol meeting in Paris. Leading scientists of the R.C.M.P. Laboratories should be involved in the international forensic science community to as great an extent as those in other areas of science within the Federal Government Agencies.

6. Aside from having their operational effectiveness, duties, and goals reviewed annually through the recently established government Program Review procedure for annual estimates, the C.D. Laboratories maintain detailed statistics of all work functions carried out, including number of cases, number of examinations, types of examinations, time spent per examination, time for cases to be completed, man-days away on duty (attendance at Court, etc.), man-miles travelled, and so on. From such data, "work units" have been devised, which is a measure of the work each member is expected to perform. In turn, by projecting the total work load anticipated for future years on the basis of work load data from past years, with each laboratory section being considered separately, estimates on manpower requirements are made in five-year forecasts. These forecasts, however, rest on existing situations and functions and, therefore, are not necessarily applicable by the time the forecast period has arrived. Performance indicators have also been developed in order that Senior Command Officers may measure both the effectiveness and efficiency of the management of the Laboratories.

7. The major hindrances to the effective performance of the C.D. Laboratories' functions have been severalfold. One has pertained to the extraordinary increase in the demand for laboratory services, particularly in the blood-alcohol field, requiring support services for newly instituted breath

testing programs from coast to coast. The present system, whereby Laboratory Scientists provide the interpretation evidence in Court on the effects of various concentrations of blood-alcohol, requires the employment of highly qualified personnel. As the Laboratories have not been able to recruit personnel for specialization in this field at a sufficient rate, it has placed unfair burdens on the present incumbents. If, however, the need for interpretative evidence is substantially reduced through revisions in the Criminal Code setting levels of blood alcohol, then the situation should ease considerably and scientists with less qualifications may be employed as designated analysts.

8. A further hindrance is the increasing amount of time scientific staff spend away from their benches giving or waiting to give evidence in Court. During the period 1967-68, a total of 2,196 man-days were spent attending court which represents an increase of 21.7% over the previous fiscal year. The total man-miles travelled by the Laboratories' staff during the same period amounted to 942,693 as compared to 819,042 man-miles for the 1966-67 period. Situations occur, all too frequently, where a scientist is required in two or three Courts in widely separated locations on the same day. Upon arrival at many Court hearings, it is found that the evidence of the Laboratory scientist is not required due to an agreement on the part of both Crown and Defence counsels to accept the findings as stated in the Laboratory report. These problems have brought about the suggestion, both in Canada and in England, that a considerable number of Laboratory findings could be made available to the Courts by way of certificate rather than through personal attendance. This would be a great improvement, reducing both the time spent away on duty and the mileage travelled by the Scientific staff. In this regard, an N.R.C. Associate Committee on Forensic Science could be of great assistance in reviewing and recommending to appropriate agencies and legislative bodies, those scientific procedures and

methodology which they consider fully acceptable from a scientific standpoint, for reporting findings by way of certificates issued by designated analysts.

9. Forensic sciences can involve a great number of scientific disciplines, such as chemistry, biochemistry, pharmacology, physiology, immunology, biology, haematology, medicine, physics, and mathematics. Application of any of the natural or physical sciences to the law would give it a forensic connotation. Naturally, no one person can become competent in them all. The team approach, therefore is necessary. As emphasized above in para. #4 of the preceding Section I, it is not enough that a forensic scientist be competent in his field as it would be applied to industry or a number of other government departments. The nature of many materials received for examination, as a result of criminal investigations, may render them unsuitable for analysis by means which are satisfactory in many other laboratories. Biological materials, in particular, are susceptible to deterioration and decomposition and so the forensic biochemist or serologist is often faced with analytical and interpretative problems which the clinical chemist, for instance, need not face. Special methods, analytical tools, and analytical pitfalls are facets with which the forensic scientist must become familiar to perform and EVALUATE his analyses. At present, the new incumbent, at all levels from non-degree technician to the Ph.D. professional level, undergoes a period of in-service training before he is permitted to perform tests or interpret results on cases submitted to the Laboratories. As a result, there is a considerable time-delay from the time a member commences employment until he becomes an effective, functional member of the Laboratory system.

10. The fact that university courses in the Forensic Sciences are not provided in Canada means that a new incumbent must start afresh in the forensic field on commencing employment in a forensic laboratory. In spite of the fact that he may be a chemist or physicist, the new person enters, to some extent,

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a foreign field. Most university students take their courses with specific purposes in mind, and very rarely does one set out to become a forensic scientist. In almost all cases, the forensic scientist has come into the field through some accidental set of circumstances. This fact is not especially surprising in view of the lack of university courses, particularly at the graduate levels and the lack of good facilities to carry out research and development work. The Crime Detection Laboratories are, at present, competitive with other government agencies with respect to salaries for those at the Bachelor's degree level and to starting salaries for persons at the M.Sc. and Ph.D. levels. As the professionals in these latter two degree categories increase in number, as they must, and become more experienced, it is realized that provision will have to be made for higher salaries in order to make forensic science highly attractive on a career basis. The reason for not offering better pay and advancement opportunities earlier was the concern over the increased manpower costs that would result in extending the operations of the Laboratories. While this concern still exists, it is felt that if we are to carry out the forensic science research and development which is now considered essential and keep up the morale of the professionals in that field, we must treat them in the same manner as senior scientists in other Federal Departments and agencies. This means providing them with the opportunities for satisfying their professional goals, aspirations and needs and with the freedom to participate in those areas, such as publications and professional meetings with their peers, which motivate scientists to do superior work. The Government must be prepared, therefore, to increase and upgrade the present establishment of the Crime Detection Laboratories to include this recommended extension into research and development work, because, as explained previously, our present establishment is geared mainly for functional police laboratory duties.

11: On the other hand, there is not an unlimited demand in Canada for forensic scientists. Therefore, if proper forensic courses were provided at the universities, it is not likely that more than about two universities should consider introducing degree courses in the forensic sciences. It is not likely that more than about twenty-five forensic scientists and technicians can be absorbed per year in Canada. Because the size of a Forensic Science Department in a university would necessarily be small, it is considered that such a university program should be operated in conjunction with an established Central Research Establishment attached to a forensic laboratory. Moreover, such an association would help to provide a good balance between the purely theoretical and the practical teaching offered. It is felt that graduate study programs could be especially fruitful if the graduate student carried out part of his research at the forensic laboratory and part at the university. Lecturers should be available from both institutions. A program such as that envisaged above should surely alleviate the present major problem relating to the shortage of properly trained forensic scientists. As noted earlier in this report however, this co-operative arrangement would only be feasible if the proposed Central Research Establishment became a reality. It would not be possible to impose this arrangement on our present set-up within the R.C.M.P. Laboratories.

12. Considering the rapid advances being made in the related fields of science, the heavy demands placed on the forensic scientists in the Courts and the fact that the forensic scientist cannot afford to err, aspects of research, training, salary schedules, promotional opportunities, and facilities must be given very high priority insofar as forensic scientific policy is concerned.

V. Personnel Policies -

1. Hiring of new Civilian Member scientists is accomplished mainly through a normal university recruitment procedure, a small scale summer employment program, and contacts made through the presentation of talks on forensic services by Laboratory scientists and administrators to professional and other groups. Also, some uniformed members of the R.C.M. Police, who indicate good potential for laboratory services and who have at least university entrance requirements, are afforded the opportunity to train as understudies in areas such as Firearms Identification or Document Examination. The most promising uniformed (i.e. Regular) members who become attached to the Laboratories after at least three years police "field" service, are afforded the opportunity to take university degree courses at public expense. In most instances, courses in chemistry or biochemistry have been taken. Extramural short courses in specialized scientific studies, plant tours and attendance at scientific conferences are also permitted.

2. Because research in the C.D. Laboratories has been on such a small scale and the number of staff who would qualify as research administrators have been so few, the matter of identifying members with high potentiality as research administrators and related functions has not been pressing. Plans have been formulated, however, for the establishment of senior specialist scientists, representing each of the laboratory sections, who will be responsible for conducting the necessary developmental research on immediate problems in their specialized fields. Therefore, these questions are now assuming considerable importance.

3. Scientists and technicians within the R.C.M.P. Laboratories include two types of members, regular (or uniformed) members and civilian members. The six regular members who are now commissioned officers all hold university degrees (2 Ph.D.'s, 1 M.Sc., 2 B.Sc.(pass) and 1 B.A.) and formerly filled functional specialist positions. Five of these Officers moved into

Laboratory administrative positions with attendant promotions to Commissioned ranks. With the exception of the Commanding Officer, Laboratories, who is a Superintendent, all Laboratory Officers hold the rank of Inspector. Four Civilian Member Scientists now hold grades equated pay-wise with the rank of Inspector and fill functional scientist positions rather than administrative positions. Up to this point in time promotion of regular members of the Laboratories (both Commissioned Officers and other ranks) has been geared to the promotional mainstream of all regular members of the R.C.M. Police. With the increasing requirement for scientists holding advanced degrees, the time is perhaps at hand when the higher salary and career structures of scientists and professionals employed in other Government departments and agencies will have to be taken into account for all scientists, both regular and civilian members, within the R.C.M.P. Laboratories.

VI. Distribution of Activities -

1. The five Crime Detection Laboratory units are situated so as to provide service to law enforcement agencies throughout Canada. Located at Vancouver, B.C.; Edmonton, Alberta; Regina, Saskatchewan; Ottawa, Ontario; and Sackville, N.B., these five regional laboratories receive exhibits resulting from criminal investigations in each of the ten Provinces and the Yukon and Northwest Territories. In order to testify in the Courts respecting their findings, the scientific staff of the C.D. Laboratories travelled a total of 675,930 man-miles last year and spent 2,196 man-days away from the Laboratories on duty. The total budget spent by the C.D. Laboratories last year was \$1,266,721.00 including salaries and rental of laboratory facilities where applicable. These were distributed as follows:

Vancouver Laboratory - \$317,044.00 (Includes
\$107,300.00 for New
Temporary Accommodation)

Regina Laboratory - \$341,294.00
Ottawa Laboratory - \$439,049.00
Sackville Laboratory - \$169,334.00

The Edmonton Laboratory did not open until 1968.

2. Table I shows the number of reports issued from each laboratory during the 1967/68 fiscal year, according to the type of offence. Table II shows the number of reports according to geographical location.

VII. Personnel Associated with Scientific Activities -

1. Table III indicates the current personnel establishment of the C.D. Laboratories according to the laboratory and categories of (1) scientist; (2) technician; (3) administration; and (4) stenographers, typists and clerks. Those who carry out research and/or examine and analyze exhibits in connection with case work, submit laboratory reports, and attend court in an expert witness capacity are included in the scientist category. Their minimum academic qualifications will vary according to the Section (reference page 6) in which they are employed. Technicians carry out work under the supervision of the scientists but do not submit reports or routinely attend Court. Employment at a scientist level in a Chemistry Section requires at least an Honours Chemistry degree. A person with a Pass or ordinary degree in Chemistry is employed as a technician or technical officer. On the other hand, a university degree is not a prerequisite for one to be employed as a technical officer in a Firearms Identification Section.

2. Table IV tabulates information regarding professional staff associated with scientific activities according to degree level. Civilian Member Scientists now outnumber Regular Member Scientists by a ratio of 40 to 17.

3. Table V shows the total number of professional staff (by Senate Committee definition) in each degree category for each of the years 1962 to 1968 inclusive and projections estimated for each of the years 1969 to 1973.

4. The percentage turnover of professional staff in the three degree categories for each of the years 1962 to 1967 is shown on Table VI. It is believed that interest in, and dedication to forensic science accounts for the low turnover rate in the Laboratories. As in the case of the R.C.M. Police as a whole, there is a remarkable esprit de corps existing in the Laboratories.

5. The percentage of current professional staff who, since graduation, have been employed by industry at one time is 7.3%; those who have been on the staff of a university represent 7.3%. None of the present staff has been previously employed by Provincial departments or other Federal agencies. Only one member in one of the three degree categories is on education leave. This is in the M.Sc. category wherein the incumbent is commencing studies (September, 1968) for his Ph.D. degree in toxicology at the University of Maryland, Baltimore, Md., U.S.A.

6. University students who have been given summer employment in a scientific activity are numbered in Table VII.

VIII. Expenditures Associated with Scientific Activities -

1. The total funds spent by the C.D. Laboratories on intramural R & D in 1967/68 approximated \$14,000.00, that on data collection \$2,955.00, and scientific information \$11,115.00. None was spent to support R & D in universities or to support higher education in engineering and science. It should be recalled that the C.D. Laboratories have been primarily service-oriented and that operational funds have been used to finance the R & D carried out to date thereby severely limiting research in this field. The scientific discipline involved, falls into the general category of forensic sciences, and the area of application is in law enforcement and national security. Table VIII indicates the funds spent on intramural R & D, data collection, and scientific information from 1962 to 1968 and those projected for the next five fiscal years.

This projection does not include provision for the recommended Central Research Establishment. No one on the C.D. Laboratories' staff is employed full-time in a research capacity and, as indicated above, to date R & D has usually been carried out in conjunction with specific operational case problems. Therefore, the exact funds spent in this area cannot be tabulated accurately since they constitute a part of the overall operational expenditures. Funds expended to further university education of staff for each of the fiscal years from 1962/63 to 1968/69 are tabulated in Table IX.

IX. Research Policies -

1. Intramural research projects are selected in accordance with those areas of service operations wherein the greatest problems exist. Criteria for such selection are based on whether it will be of significant advantage to develop analytical methods which are more sensitive, more specific, faster, and quantitatively more accurate than present procedures. Also, procedures developed for basic research techniques reported in industrial and other research laboratories are investigated to determine their possible forensic application. Those which appear to promise more efficient and effective analyses than are conducted at present are selected for detailed study so that they may be modified and adapted to forensic investigations with a view to replacement of existing techniques. This approach applies to all Sections of the C.D. Laboratories. Priorities are established on the basis of requirement and available staff, equipment, and funds. In view of the rather small scale of the research program, confined as it is at present to only immediate operational problems, network methods such as Critical Path Network or Program Evaluation and Review Technique are not used to plan and monitor programs and projects. Several Laboratory Officers have, however, taken management courses conducted by the Bureau of Management Consulting Services, Public Service Commission of Canada, in which these techniques were studied.

X. Research Output -

1. A major area of research in the C.D. Laboratories during recent years has involved drinking, driving, and breath tests. As a result, the following journal articles have been published:-

- a) Alcohol Levels in Body Fluids After Ingestion of Distilled Spirits, by B.B. Coldwell and H.W. Smith, Canadian Journal of Biochemical Physiology, 37:43-52(1959).
- b) Some Characteristics of Suspected Drinking Drivers by B.B. Coldwell and G.L. Grant, Third International Conference on Alcohol and Road Traffic, London, England, September 3-7, (1962).
- c) A Study of Some Factors Affecting the Accuracy of the Breathalyzer, by B.B. Coldwell and G.L. Grant, Journal of Forensic Sciences, 8:149-162(1963).
- d) The Disappearance of Alcohol From the Blood of Diabetics, by B.B. Coldwell and G.L. Grant, Journal of Forensic Sciences, 8:220-230(1963).
- e) A Note on the Estimation and Disappearance of Alcohol in Blood, Breath and Urine from Obese and Diabetic Patients, by B.B. Coldwell, Journal of Forensic Sciences, 10:480-489(1965).
- f) Rate of Metabolism of Radioactive Ethanol in Cold Environment, by N. Platonow, B.B. Coldwell, and L.P. Dugal, Quarterly Journal of Studies on Alcohol, 24:385-397(1963).

Much data pertaining to the role of alcohol in traffic accidents and the correlation between blood alcohol level and degree of impairment have been obtained through research during the last three years which is, as yet, unpublished.

2. The major annual conference, by which information regarding the results of projects is given to extramural groups, is that of the Canadian Society of Forensic Science. Each year, the locale of the annual meeting alternates between an eastern and a western centre. Information is also transferred through the presentation of papers at the regional conferences of the Chemical Institute of Canada, the meetings of the American Academy of Forensic Sciences, and the presentation of papers by invitation, to miscellaneous professional groups.

3. Research tools and procedures of value which have been added or developed during the last five years include:

- a) Routine use of Thin Layer Chromatography and Gas Chromatography for the analysis of alkaloids,

barbiturates, hallucinogenic and other drugs, affording improved sensitivity and specificity in the analyses.

- b) Use of Nuclear Magnetic Resonance instrumentation to determine constituents of unknown compounds.
- c) Applications of Neutron Activation Analysis to forensic problems.
- d) Design of a program to provide the necessary support services for large scale enforcement breath testing programs in connection with drinking and driving offences.
- e) Development of a system of reference drug standards, whereby specimens of all drug tablets and capsules are obtained, coded, and filed for reference purposes.

XI. Projects -

1. Although research in the C.D. Laboratories has, to date, been primarily a by-product of operational activities and has taken place on a small scale, some projects are, nevertheless, worth noting.

a) Basic Research

Further research has been conducted correlating blood alcohol levels and impairment of ability to carry out tasks related to driving. Approximately 400 drinking subjects whose blood alcohol concentrations have ranged from 0.20% to 0.03% have been tested on simulated driving devices and have undergone visual acuity, distance judgment, and other examinations to determine the extent of deterioration of performance as compared to their sober performances. Because considerable controversy exists in older literature, it is of extreme importance that all C.D. Laboratory personnel employed in this specialized field gain as much first-hand experience as possible. These experiments have, therefore, served a two-fold purpose; namely, to gain more data for basic research purposes and to provide training for the professional personnel who enter this field.

b) Applied Research

i) Tests on factors affecting the accuracy of the Breathalyzer have been conducted in detail. In view of the increasing demand for breath tests as an alternative to direct blood analysis for alcohol, it was considered necessary to critically test the various possible parameters associated with the Breathalyzer. Factors such as cylinder temperature or the quantity of reagent in the ampoules or the ampoule size have been investigated to ascertain the reliability of the Breathalyzer. Numerous correlation tests have been conducted, wherein Breathalyzer and blood tests taken at the same time have been compared. Numerous correlation tests involving urine have also been carried out.

ii) Many "on-the-spot" or "roadside" tests for alcohol in breath have been placed on the market. While the products from different manufacturers appeared to be similar in most respects, considerable differences existed with respect to the claims made for the devices. In order to assess these "on-the-spot" tests and learn their limitations, a project was commenced to investigate the test devices. The tests proved that the roadside testers such as the "Alcotest", "Mobat", and "Alcolor" cannot be used further than as preliminary screening tests which require independent confirmatory analysis. They are not a substitute for the Breathalyzer (which is a specific, patented, instrument), or any other accurate test.

c) Development

i) In recent years, extremely potent drugs such as LSD (Lysergic Acid diethylamide) have become

drugs of abuse by some individuals and groups. This remarkable potency, wherein 50 to 70 micrograms of LSD, when ingested, can cause a "trip" of considerable proportion, required the chemical analysts to devise extremely sensitive analytical techniques in order to identify LSD and related compounds with certainty. It will be appreciated that 50 micrograms is equivalent to $\frac{1}{20,000}$ grams or $\frac{1}{600,000}$ ounces. As a result of basic and applied research, much carried out by research workers at the FDA Laboratory, Washington, D.C., personnel at the C.D. Laboratories have developed an orderly and systematic analytical procedure for this class of drug, which is extremely sensitive, rapid, and accurate.

- ii) Cases involving theft of gasoline from bulk storage tanks have caused a problem with respect to the identification of the gasoline which has been stolen. To assist, a testing kit has been developed for ascertaining the presence of an added marker in a sample of gasoline or other petroleum product. The advantages of this kit are its simplicity, an elimination of any requirement for retaining a specimen of the gasoline in question, and the fact that the initial on-the-spot tests do not necessitate the use of any chemical reagents. The test involves sampling the questioned gasoline; however, in withdrawing a sample from a tank with the kit, the investigator draws the sample through a filter which retains the marker that had previously been added. The marker material becomes visible in the filter and for a confirmatory analysis, only the filter need be forwarded to the Laboratory.

2. This brief has been prepared for the information of the Special Committee of the Senate on Science Policy which has been appointed to consider and report on the science policy of the Federal Government.

OTTAWA
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TABLE I
 REPORTS ISSUED BY R.C.M.P.
 LABORATORIES ACCORDING
 TO TYPE OF OFFENCE
 1967-68

<u>Type of Case</u>	<u>V</u>	<u>R</u>	<u>O</u>	<u>S</u>	<u>TOTAL</u>
Murder & Attempt	108	94	8	41	251
Suicide & Attempt	42	14	1	12	69
Sudden Death & Coroner's Act	126	121	10	167	424
Sexual Offences	112	138	5	53	308
General Assaults	6	11	3	5	25
Impaired & Drunken Driving	232	171	0	40	443
Fail to Remain at Accident & Hit and Run	76	69	14	44	203
Forgery & Uttering	216	88	206	74	584
Counterfeiting	3	1	6954	0	6958
B.E. & T. and Armed Robbery	204	152	42	92	490
Arson	23	8	3	20	54
Customs & Excise	12	2	4	0	18
Narcotic Control Act	24	36	9	15	84
Food & Drug Act	2	9	2	0	13
Game Acts (Prov.)	4	18	0	3	25
Liquor Acts (Prov.)	3	10	0	7	20
Vehicle & Highway Acts (Prov.)	2	9	0	1	12
Others & Unknown	595	332	764	238	1929
TOTAL REPORTS	1790	1283	8025	812	11910

TABLE II
 REPORTS ISSUED BY R.C.M.P.
 LABORATORIES ACCORDING TO
 GEOGRAPHIC LOCATION
 1967-68

<u>Geographical Source</u>	<u>V</u>	<u>R</u>	<u>O</u>	<u>S</u>	<u>TOTAL</u>
Yukon Territories	71	3	10	0	84
North West Territories	1	61	11	1	74
Newfoundland	0	0	21	104	125
Prince Edward Island	0	0	4	38	42
Nova Scotia	0	0	20	261	281
New Brunswick	0	0	133	407	540
Quebec	0	0	1185	0	1185
Ontario	0	5	6067	0	6072
Manitoba	2	220	192	0	414
Saskatchewan	4	630	9	0	643
Alberta	3	339	156	0	498
British Columbia	1709	24	209	0	1942
Outside Canada	0	1	8	1	10
TOTAL REPORTS	1790	1283	8025	812	11910

TABLE III

ESTABLISHMENT - C.C. LABORATORIES

(As of Sept. 6, 1968)

NUMBER OF PERSONNEL

LABORATORY	Administrative				Stenos Clerks Typists	TOTAL
	Scientists	Others	Scientists	Technicians		
LAB HQ	2				2	4
Vancouver	1		17	8	3	29
Edmonton	1	1	6	8	1	17
Regina	1	1	17	10	4	33
Ottawa	1	2	7	21	6	37
Sackville	1	1	9	5	2	18
TOTAL	7	5	56	52	18	138

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TABLE IV

PROFESSIONAL STAFF - C.D. IABS. SEPT., 1968

Ph.D.	Country of Birth	Age	Country Education Received		Years Since Graduation	Years Employed with RCMP Lab.
			Secondary School	University		
Supt. Eves	Canada	49	Canada	Canada	8	26
Insp. Bergh	Canada	39	Canada	Canada	3	15
Dr. Beveridge	Scotland	28	Scotland	Scotland	4	1
Dr. Singal	India	33	India	India	5	1
Dr. Baird	Ireland	32	Ireland	Ireland	5	1
Dr. Rodgers	Scotland	28	Scotland	England	2	4
<u>Masters</u>						
Mr. Radych	Canada	41	Canada	Canada	17	17
Mrs. Rouen	France	49	France	France	17	12
Insp. Kerr	Canada	36	Canada	Canada	4	12
Mr. Peel	Canada	29	Canada	Canada	3	3
Miss Pawlovich	Canada	29	Canada	Canada	4	2
Miss Kotylak	Canada	24	Canada	Canada	2	1
Mr. Wood	England	25	England	Wales	3	1
Mr. Joynt	Canada	28	Canada	Canada	1	2
<u>Bachelor (Honours)</u>						
S/Sgt. Picton	Canada	37	Canada	Canada	5	12
S/Sgt. Tweed	Canada	38	Canada	Canada	7	11
S/Sgt. Hoday	Roumania	35	Canada	Canada	5	10
Mr. Corrigan	Canada	39	Canada	Canada	16	10
Mr. Reeve	Canada	27	Canada	Canada-USA	3	3
Mr. McLeod	Canada	29	Canada	Canada	4	2
Miss Hiebert	Canada	26	Canada	Canada	1	1
Mr. Smith	England	25	England	England	3	1
Mr. Sumner	Canada	25	Canada	Canada	2	1
Mr. Robertson	Canada	25	Canada	Canada	2	1
Mrs. Matthias	Canada	24	Canada	Canada	2	1
Mrs. Somers	Canada	25	Canada	Canada	1	4
<u>Bachelor (Pass)</u>						
Insp. Huber	Canada	47	Canada	Canada	9	19
S/Sgt. James	Canada	42	Canada	Canada	18	17
S/Sgt. Gazey	England	37	England	Canada	9	17
Mr. Renaud	Canada	39	Canada	Canada	17	17
Insp. Headrick	Canada	37	Canada	Canada	5	16
Insp. Duke	Canada	39	Canada	Canada	9	16
S/Sgt. Hodgins	Canada	42	Canada	Canada	9	16
S/Sgt. Robertson	Canada	38	Canada	Canada	9	12
Sgt. Paynter	Canada	32	Canada	Canada	4	9
Sgt. Mooney	Canada	30	Canada	Canada	2	7
Cpl. Elves	Canada	32	Canada	Canada	1	6
Mr. Nelson	Canada	27	Canada	Canada	4	4
Mr. Saturley	Canada	23	Canada	Canada	3	3
Miss Long	Canada	26	Canada	Canada	2	2
Miss Fahl	Germany	26	Canada	Canada	4	2
Miss Smith	Canada	23	Canada	Canada	2	2
Miss Williams	Canada	22	Canada	Canada	2	2
Miss Bates	Canada	22	Canada	Canada	1	1
Miss Beaumont	Canada	22	Canada	Canada	1	1
Miss Berkan	Canada	23	Canada	Canada	2	1
Mr. Evers	Canada	27	Canada	Canada	1	1
Mrs. Ferris	Canada	27	Canada	Canada	6	1
Mr. Gass	Canada	23	Canada	Canada	1	1
Miss Heuchert	Canada	22	Canada	Canada	2	1
Mr. Deobald	Canada	23	Canada	Canada	1	1
Miss Brown	Canada	21	Canada	Canada	1	1
Miss Boyd	Canada	25	Canada	Canada	4	1
Miss Mrazek	Canada	22	Canada	Canada	1	1
Cst. Towson	Canada	27	Canada	Canada	1	1
Miss Vinnick	Canada	22	Canada	Canada	1	1
Miss Wells	England	22	Canada	Canada	2	1

TABLE V
NUMBER OF PROFESSIONAL STAFF - C.D. LABS.
1962 to 1968 & Estimated to 1973

DEGREE	1962 - 1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	
Bachelor	12	14	15	15	21	29	45	51	55	62	65	67
Master	2	2	3	4	4	5	6	8	8	8	9	10
Doctorate	1	1	1	2	2	4	6	8	9	9	9	10

TABLE VI

PROFESSIONAL STAFF TURNOVER - C. D. LABS.PERCENT TURNOVER

DEGREE	1962	1963	1964	1965	1966	1967
Bachelor	0%	0%	20%	20%	0%	2%
Masters	0%	0%	0%	0%	0%	0%
Doctorate	0%	0%	0%	50%	0%	0%

TABLE VII

NUMBER OF UNIVERSITY STUDENTS GIVEN SUMMER EMPLOYMENT

C.D. LABORATORIES

Year	1962	1963	1964	1965	1966	1967	1968
No. of Students	0	0	0	0	2	3	4

TABLE VIII

C.D. LABORATORY EXPENDITURES (\$)

Fiscal Year	Intramural R & D	Data Collection	Scientific Information
1962/63	4,000.00	1,000.00	5,000.00
1963/64	5,000.00	1,000.00	6,000.00
1964/65	5,000.00	1,000.00	7,000.00
1965/66	8,000.00	1,000.00	8,000.00
1966/67	10,000.00	1,000.00	9,000.00
1967/68	14,000.00	2,955.00	11,115.00
1968/69	25,000.00	5,000.00	9,327.00

TABLE IX

FUNDS TO FURTHER UNIVERSITY EDUCATION - C.D. LABS.

Fiscal Year	Expenditure
1962/63	17,000.00
1963/64	15,500.00
1964/65	10,000.00
1965/66	15,500.00
1966/67	16,500.00
1967/68	17,500.00
1968/69	51,725.00

APPENDIX 48

THE SCIENTIFIC POLICIES AND PROGRAMMES OF
THE NATIONAL MUSEUM OF NATURAL SCIENCES
OTTAWA, CANADA
BY A.W.F. BANFIELD, DIRECTOR

Resume

Canada is woefully behind most other civilized countries in promoting museums as national cultural and scientific institutions. The important role national museums can play in uniting its citizens in an appreciation of their natural and human heritage seems to have been sadly underestimated by successive Canadian federal governments.

The biological and geological research undertaken in natural science museums is not normally duplicated by universities or other federal departments. Museological subjects are seldom emphasized at universities in spite of their practical importance in many modern related studies.

There is a current shortage of museum personnel and inadequate training facilities in Canada in the face of a surge in the construction of new provincial museums.

Museums play a unique role as public communication centres keeping the public informed of developments in the scientific fields, and providing an avenue of appreciation of the human environment.

History of Museums

1. Museums have a long history. The first was founded by the Greek Pharoah Ptolemy in Alexandria, Egypt, in 285 B.C. It was the World's centre of learning and was called the Museion - temple of the Muses. It contained a great manuscript library, laboratories, workshops and collections of scientific instruments and natural history specimens.
2. During the middle ages kings, princes, and bishops continued the museum concept in their private "Royal Cabinets" which preserved the curiosities of nature for their own amusement and for the study of their scientific protégés. The first modern public museum was the Musée d'Histoire naturelle in Paris which was established in 1636, followed by the British Museum in London in 1753. Most of the great museums of the World, including the Smithsonian Institute of Washington, were founded during the nineteenth century.
3. The role played by museums in the cultural life of the community has changed over the years. Originally the collections were just for the appreciation and study of private scholars. During the eighteenth and nineteenth centuries the museums opened their doors to the public, to observe the wonders of nature. Often nineteenth century museum galleries looked like frozen arks with pairs of stuffed animals - male and female, in endless queues. Museums during the twentieth century have developed a new dimension as public communication centres with the development of their extension services: lectures, films, scientific demonstrations, lively exhibitions, popular and scholarly publications and finally participation in the television medium. To-day there is hardly a civilized country which does not recognize the importance of having strong museums to foster national pride in the cultural, historical and natural heritages of its citizens. The important unifying role of a strong national museum is recognized by almost every government.

History of the National Museum of Canada

4. Almost 1200 years after the first Museion was destroyed by the Arabs, the National Museum of Canada was founded by a native Montrealer, Sir

William Logan, in 1842. Logan was appointed first Provincial Geologist of the United Provinces of Upper and Lower Canada and he is known primarily as the founder of the Geological Survey of Canada. Before he took up his post, Logan had been curator of the geology department of the Royal Institution of South Wales in Swansea. Quite naturally he had strong museum interests and soon commenced the formation of a collection of Canadian rocks and minerals. His interests extended to other natural sciences as well. He was a bird taxidermist and a botanist as well. In 1856, he obtained the appointment of Elkanah Billings as the first palaeontologist and the following year a Mr. D'Urban was hired as naturalist and botanist. The Geological Survey moved to the new Capital in 1880 and occupied the Clarendon Hotel on Sussex Street, where it set up its museum exhibits.

5. With such an auspicious pre-Confederation start one might have expected the Museum to have developed into a strong national institution, but this was not the case. Its development was extremely slow and subject to numerous frustrating relapses.

6. In 1904, fifty years after Logan's recommendation, a start was made on building the Victoria Memorial Museum over a bed of clay in central Ottawa. In 1910, the Geological Survey and its museum moved in and, shortly afterwards, serious structural defects developed. By 1915, the entrance tower commenced to separate from the rest of the building and the tower was therefore removed. On February 3, 1916, the Centre Block of the Parliament Buildings was destroyed by fire and Parliament moved into the museum and continued to occupy the building until May, 1920.

7. The East Wing of the building had been made available to the National Gallery in 1911, and much of the remainder of the building was occupied by offices of the Geological Survey. As a result of this use of the Museum's building, very little space was available for the traditional museum functions of exhibition, research and extension from 1910 to 1960.

8. However, in 1959, the Geological Survey moved to new quarters and the

next year the National Gallery moved out as well. As a result, the building that had been designed as a museum was finally made available for that purpose fifty years after construction. However, the building was obviously unsound and, after an engineering survey, plans were approved in 1962 to construct a new National Museum, to be opened July 1, 1967. Subsequently the Government has postponed the start of construction on a number of occasions and as of October 1, 1968, there are no plans approved for this project. Currently the research divisions of the Museum of Natural Sciences occupy quarters in five different buildings. The Palaeontology Division moved on October 12 from the Clarendon Hotel Annex which it has occupied since the first move to Ottawa in 1880.

9. While there have been these long delays in providing a suitable building for a National Museum, the responsibility for the administration of the Museum has also passed through several departments. From 1842 to 1950, the Museum was part of the Geological Survey of Canada. In 1950, the Museum was transferred to the Department of Resources and Development (the predecessor of the current Department of Indian Affairs and Northern Development). In 1964, it was transferred to the Ministry of the Secretary of State. Finally this year it has become part of the National Museums of Canada Corporation, responsible to the Secretary of State as envisaged by Vincent Massey in the Royal Commission on National Development in the Arts, Letters and Sciences, 1949 - 1951.

Legislative History

10. The first statement of the Museum's functions seems to have been in the Geological Survey Act of 1890:

4(b) "To maintain a museum of geological and natural history and to collect, classify and arrange for exhibition in the museum ... such specimens as are necessary to afford a complete and exact knowledge of the geology, mineralogy ...; fauna and flora of Canada."

This antiquated scientific terminology was repeated in Act after Act until this decade.

11. The Museum has had its functions clearly defined for the first time in modern terms under the new National Museums Act, 16 Eliz. II, Chapter 21, 21 December, 1967. The purposes and powers of the Museums Corporation are stated in section 5:

- (1) The purposes of the Corporation are to demonstrate the products of nature and the works of man, with special but not exclusive reference to Canada, so as to promote interest therein throughout Canada and to disseminate knowledge thereof.
- (2) In furtherance of its purposes the Corporation may
 - (a) collect, classify, preserve and display objects relevant to its purposes;
 - (b) undertake or sponsor research relevant to its purposes;
 - (c) arrange for and sponsor travelling exhibitions of materials in, or related to, its collections;
 - (d) arrange for the acquisition or publication and the sale to the public of books, pamphlets, replicas and other materials related to its purposes;
 - (e) undertake or sponsor programs for the training of persons in the professions and skills involved in the operation of museums;
 - (f) establish adequate liaison with other museums and universities with a view to securing maximum collaboration of all activities in this field and, for such purposes, establish a committee or committees pursuant to section 13;
 - (g) arrange for or provide professional and technical services to other organizations whose purposes are similar to any of those of the Corporation, on such terms and conditions as may be approved by the Minister;
 - (h) generally, do and authorize such things as are incidental or conducive to the attainment of the purposes of the Corporation and the exercise of its powers.

The Role of Museums

12. The fundamental feature which separates museums from universities as teaching institutions is the possession of collections. Museums collect three-dimensional objects (the facts of life) in order to preserve them for immediate and future study. Often two-dimensional representations of these objects are found in text books that are studied by university students. Although in art and ethnographic museums the specimens are usually unique, this is not the usual case in natural science museums. In our museums the specimens are taken as samples of the infinitely variable universe. In order to have important collections in the natural sciences the collections must be well-documented, well-curated and must be significantly large. Like atomic piles there is also a critical size in collections, above which they contain much intrinsic information that scientists may expose through study. Such collections are important national biological research facilities just as surely as are other scientific installations in the fields of physics and chemistry. Museums of natural sciences also contain some truly unique specimens. These are the so-called type specimens upon which the original description of the species were based. Other valuable specimens of extinct animals and plants may be considered unique and, similarly, most fossil specimens may be considered unique.

13. Research is the second basic function of museums. The Alexandrian Museion was a research institute and this tradition has been continued in most, if not all, of the World's great museums ever since. The importance of research in museums has recently been reconfirmed by a resolution of the International Council of Museums Eighth General Conference at Munich, Federal Republic of Germany, August 9, 1968.

14. Museums are the traditional home of research in systematic and evolutionary biology - one of the core disciplines of biology. One can recall the names of famous French biologists Buffon, Cuvier, Lamarck and St. Hilaire, whose researches were centred at the Musée d'Histoire naturelle in Paris. To-day this subject is not fashionable at universities where the emphasis has

been placed on experimental molecular and cellular biology. Few students are attracted to systematic biology in spite of the growing need for systematists to identify organisms important in other research studies.

15. Some of the various investigations in which the Museum is co-operating by providing identifications are listed below.

- (a) Environmental studies to improve the quality of mans environment: ecology.
- (b) Public health surveys - identification of bats carrying rabies.
- (c) Water pollution and air pollution studies - identification of indicator species.
- (d) Oceanographic surveys: search for new proteins - foods for an exploding human population.
- (e) Bird strikes in modern jet aircraft engines - identification of the bird remains.
- (f) Stratigraphic dating of geological beds by means of fossil identification.
- (g) Identification of economically important minerals.
- (h) Identification of specimens used in biological research at universities.

16. Public exhibition is another traditional museum function. In modern society, museums serve as important communication centres. They constitute an important interface between the sciences and the citizen. Here again the teaching methods are quite different than those of universities. The emphasis is on three-dimensional exhibits and demonstrations and the importance of the text is de-emphasized. Attempts are made to appeal to at least four senses of the visitor: sight, touch, hearing and even smell! Exhibits are planned for the casual visitor as well as for the elementary and advanced student. The casual visitor may obtain a knowledge of the world about him which he can assimilate at his own pace with a minimum of effort. No wonder museums have been described as "the poor man's universities".

Visitors now demand the most modern display techniques utilizing colour, action, good design, and personal involvement in the exhibits.

17. The final basic museum function is extension - the means developed to extend its program beyond the visitors to its galleries. These means include publications, both scholarly, and popular pamphlets to explain exhibits to non-technical audiences. There is the presentation of lectures for the young and adults. The production of films and filmstrip and the arrangement of travelling exhibits to schools, fairs and other museums.

18. In spite of the severe limitations outlined in the previous paragraphs 6, 7, 8 and 9, the Museum of Natural Sciences has developed a full program in all these areas to the best of its limited resources.

Current Canadian Situation

19. In 1951, Vincent Massey described the public apathy to museums in Canada, which placed this country far behind other European and Commonwealth countries in this field. However, the situation changed dramatically by 1967. A number of provinces and cities chose to build museums, art galleries and related institutions as Centennial Projects. Starting with the Charlottetown Confederation Centre, completed in 1964, the Canadian Museums Association has estimated that 100 million dollars will be spent on the construction of new museums by 1970, when most of the projects will be completed. Seven provinces accepted Federal Government Centennial grants to build provincial museums and there were one hundred and forty museum projects at the community level. The Canadian Museums Association estimated 30 million visitors to Canadian museums in 1967.

20. Unfortunately in the face of this great surge of new museum construction, there is a national shortage of qualified curators, trained technicians and experienced museum administrators. Many of the new staff for these museums must be recruited from abroad. Often the salaries offered for university-trained professional curators are not competitive with salaries offered by Canadian universities for comparable positions. This discourages

good Canadian students from training for museum posts.

21. To-day the traditional museum subjects of systematic and evolutionary biology, palaeontology and mineralogy are not favoured by Canadian universities. There are no faculties that specialize in training students for museum and related positions. Very few universities have established research collections in these fields. Most university museums contain small collections primarily for teaching purposes. University administrators are loath to assume the heavy responsibility for maintaining large collections, such as providing expanding space, curatorial technicians, laboratories, documentation facilities and staff. Most university officials that I have interviewed believed that such facilities are peripheral to the universities central teaching responsibilities.

The Museum of Natural Sciences
Proposed Program

22. From the review of the current situation in Canada presented in the previous sections, it is evident that there is an urgent need to develop a national policy in museum research in the natural sciences. Furthermore, the resources now available to us for development both in manpower and collections are limited. It would appear reasonable to integrate our limited museum resources, rather than to duplicate our efforts or compete.

23. As a general policy statement: our museum proposes to play a leading role on a national basis in interpreting man's natural heritage and Canada's natural resources to Canadians through an integrated program of basic research, lively exhibitions, and a vital extension program. In order to fulfil this role, we must develop the following individual programs.

24. The national collections in botany, zoology, mineralogy and palaeontology must be enlarged in order to provide research facilities for visiting scientists and university students as well as to provide strong core collections from which exhibits, loans and travelling exhibitions can be made. Such growth could be assured if collections made on federal funds in other departments would normally be deposited in the National Museum upon completion of

the initial studies. The National Museum should also be considered the natural depository for new biological and mineralogical type specimens described by Canadian authors. The museum intends to proceed with the development of its automatic data processing methods for the national collections. In this field we are already among the leaders in the international museum field.

25. We propose to develop our intramural research program in systematic biology, palaeontology and mineral sciences in order to keep abreast of the other great national museums in the World. This type of research is not being conducted to any large extent by any Canadian university and they do not indicate any desire to assume the responsibility of maintaining the necessary large collections. We propose to fill in the gaps in research conducted by provincial museums.

26. We propose to develop our role as a national identification centre for the many practical surveys in oceanography, pollution, etc., now under way. Our Canadian Oceanographic Identification Centre may be mentioned here as a unit which is proving its worth daily, but it sorely needs more staff to perform its function.

27. We propose to co-operate with Canadian universities and other institutions to train professional museum personnel through the media of:

- (a) awarding grants or contracts to professors and students conducting research in the museums fields.
- (b) the presentation of courses, lectures and laboratory courses in co-operation with local universities. (Our curators might well hold cross appointments on university faculties. A number already serve on graduate committees.) The training of museum curators could best be conducted at the Royal Ontario Museum in co-operation with the University of Toronto.

28. We propose to continue our training program for museum technicians through co-operation with External Affairs Colombo Plan, the Department of Indian Affairs and Northern Development and the Canadian Museums Association.

29. We propose to act as part of Canada's National Museums complex in international museum affairs through co-operation in the programs of the International Council of Museums and through co-operation in other international museum projects such as: the Flora of North America project sponsored by the American Institute of Biological Sciences, the International Biological Program, and the international program of implementing automatic data processing methods in natural science collections sponsored by the Smithsonian Institute at Washington. We propose to continue the present co-operative research program with the Institute of Jamaica and possibly enlarge the program to include cultural exchange projects with other countries.

Current Government Support Needs

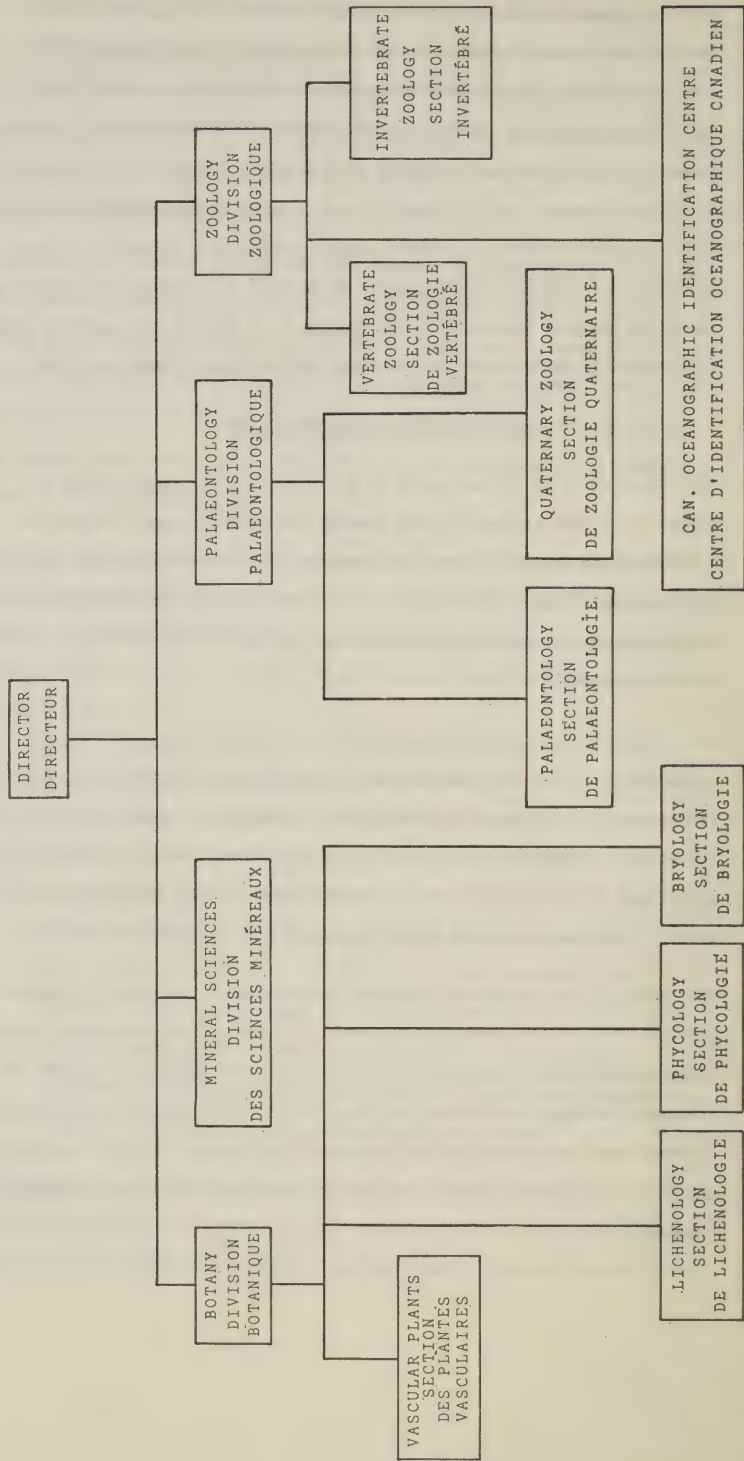
30. In order to fulfil our goals to act as a truly national museum we urgently need the approval of the museums park plan presently before the government and the early start on a building to house the national collections, laboratories, library and other services. The longer term development plans include exhibition buildings, specialized gardens, geological court, children's zoo and aquarium.

31. Secondly, we need increased staff for the sorely pressed divisions maintaining the national collections. Specifically we need more curators and technicians in palaeontology, biological oceanography, ichthyology, ornithology and mineral sciences in order to provide the growing services demanded by the public and scientific community. Our five-year forecast presented in 1967 called for 32 new positions and an increased salary primary of \$350,000.

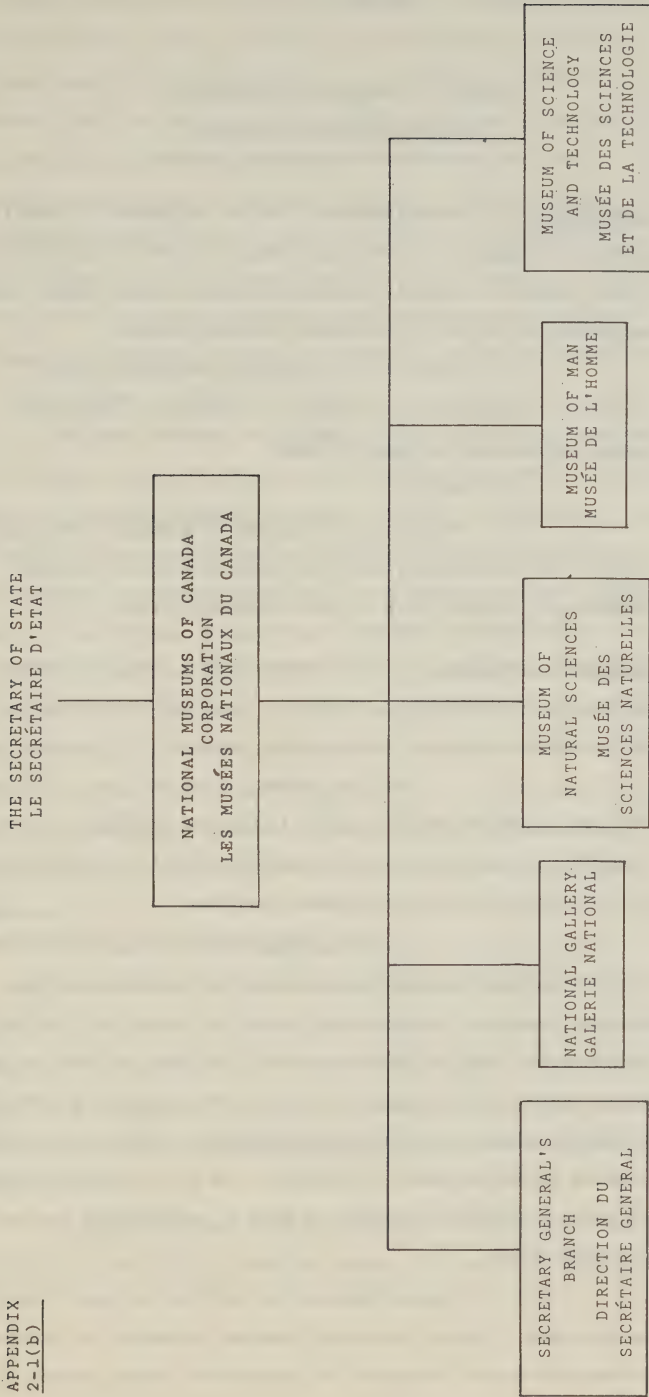
32. Finally, an increase of \$200,000 in the Museum's Estimates is needed to provide funds for the awarding of grants, or contracts to university students studying museological subjects, for the support of university research in systematic biology and related subjects, and for the support of other Canadian museums which have important collections in the natural sciences requiring maintenance assistance in the form of cabinets, laboratory and documentation equipment.

NATIONAL MUSEUM OF NATURAL SCIENCES
MUSÉE NATIONAL DES SCIENCES NATURELLES

APPENDIX 2-1(a)



APPENDIX
2-1(b)



APPENDIX 1

APPENDIX. INFORMATION REQUESTED IN
GUIDELINE FOR SENATE COMMITTEE

- 2.1 Organization. (a) The organization chart of the Museum of Natural Sciences is appended. All divisions conduct intramural research and support extramural research, although extramural research support has been minimal up to date in the Mineral Sciences Division.
- (b) The chart of the National Museums of Canada Corporation is appended and its method of reporting to Parliament through the Secretary of State is shown.
- (c) N/A.
- (d) There are no formal signed agreements involving the Museum in international science. The Museum is involved in several international projects which are described under section 2.2 (c).
- 2.2 Organization functions. (a) The Museum operates under the National Museums Act, 16 Elizabeth II, Chapter 21, (assented to 21st December, 1967). The functions are discussed under paragraph 11 of the main brief.
- (b) The evolved science policies of the Museum since its foundation have been guided by the word and spirit of the Acts under which it has functioned (note paragraphs 10, 12 to 18) and in line with internationally recognized museum functions.
- (c) The relationships between the Museum and other federal departments and other related institutions are close, friendly, complex and in some areas in need of future clarification. The Museum has acted in close co-operation with other Canadian museums for many years. We have supported a few research projects at other institutions, notably the Royal Ontario Museum in Toronto and the New Brunswick Provincial Museum at Saint John. We have exchanged, donated and loaned specimens for exhibit and study to many Canadian museums and to museums abroad.
- We have a signed understanding with the Geological Survey of the Department of Energy, Mines and Resources concerning the division of the National Mineral Collection (we maintain the display collection and

they maintain the synoptic study collection). The responsible curators work together very closely. The Museum once had an insect collection which was transferred to the Department of Agriculture in 1916, after the Centre Block fire (see para. 6). The National Insect collection now comes under the jurisdiction of the Entomology Research Institute, Department of Agriculture. Through an exchange of letters of mutual understanding between directors, the policy has been established that E.R.I. is responsible for systematic collections of terrestrial arthropods such as insects, spiders, centipedes and millipedes, on the other hand the Museum is responsible for aquatic arthropod groups such as crustaceans and all other groups of invertebrate life.

Herbaria containing collections of flowering plants, ferns and fungi are maintained in the Taxonomy and Economic Botany, and the Mycology Sections of the Plant Research Institute, Department of Agriculture. The problem of duplication of effort was discussed by the directors of the Museum and P.R.I. and a gentleman's agreement reached to restrict duplication of effort. Under the agreement the Museum volunteered not to duplicate Agriculture's fungi collection and to turn fungi collections over to P.R.I. In return, P.R.I. volunteered not to duplicate collections of algae, lichens, liverworts and mosses which form part of the Museum's National Herbarium. The problem of duplication in flowering plants and ferns remains unsolved. The Museum stated its policy to specialize in arctic and subarctic plants and not to duplicate the P.R.I.'s tropical collections.

In recent years the Museum has received warm co-operation from various divisions of the Fisheries Research Board. Museum staff have taken part in a number of oceanographic cruises in the Pacific and Atlantic Oceans and in the Caribbean Sea. We have received many important collections made by F.R.B. scientists. In return our Canadian Oceanographic Identification Centre has worked almost full time identifying oceanic plankton for F.R.B. surveys.

Through discussions, a gentleman's agreement has been reached with the Director of the Canadian Wildlife Service, Department of Indian Affairs

and Northern Development, whereby that Branch would not conduct or sponsor research in systematic biology, while at the same time the Museum would not sponsor research in wildlife management. The Museum has received valuable collections from C.W.S. scientists and, in return, has identified many collections of plants and animals for special C.W.S. investigations.

The National Research Council does not conduct intramural research in any of the subjects studied at the Museum. The N.R.C. university research grants program does occasionally cover applications for support in systematic biology. However, this area is not currently given a high priority by N.R.C., and most university specialists in this field state that there is inadequate Canadian support for such studies at present. The Museum's modest extramural research contract program may be said to complement N.R.C.'s more important role in this field. The President of the National Research Council is an ex-officio member of the Board of Trustees of the National Museums of Canada. At a recent meeting of the Policy Committee he stated he wished to see the Museum's program continued. Museum staff members sit on some N.R.C. Associate Committees. Three N.R.C. postdoctoral fellowships in systematic biology and palaeontology are tenable at the Museum of Natural Sciences.

International Co-operation. Several members of the staff serve on international scientific organizations. For instance I serve as Secretary of the International Council of Museums' Committee for Natural History Museums. The Museum is involved in several international programmes. One of the most important is the International Biological Program. Our Canadian Oceanographic Identification Centre was organized upon the request of the Canadian Committee for I.B.P. (a N.R.C. Associate Committee) to serve a national need in the identification of plankton obtained on Canadian oceanographic surveys. Another international project is the Flora of North America sponsored by the American Institute of Biological Sciences and supported by North American botanical associations.

Of particular interest is the Museum's co-operative research project with the Institute of Jamaica, Kingston, Jamaica, which was initiated upon the

official request of the Jamaican government. This is a co-operative research programme in Jamaica whereby we train Jamaican museum technicians and share collections. It has been commended by the Department of External Affairs.

The Museum has supported museum expeditions undertaken by curators of other museums to such places as the Falkland Islands and the Fiji Islands.

(d) The effectiveness of research projects, duties of officers and divisional goals are constantly under review by section heads and division chiefs. Proposed changes are discussed at curators meetings and decisions are made by the director. The basis for changes are: (1) findings in the scientific literature of the World, (2) the discovery of gaps in knowledge, (3) the research programs of other Canadian, or foreign museums, (4) specific requests from other agencies and societies, (5) the completion and publication of our own research current projects.

(e) Outside consultants have been employed to appraise performance and to conduct feasibility studies. In 1967-68, DCF Consultants, Toronto, were engaged to conduct a feasibility study of the implementation of automatic data processing methods in our collections. During the same year Dr. John Wickstead of the Plymouth Marine Laboratory was engaged to establish guidelines and appraise performance in the Canadian Oceanographic Identification Centre. Five years ago the total museum program was reviewed by a consultants firm in a departmental study of financial program review.

(f) The divisions and sections of the Museum are discipline oriented in a hierarchical system. (The curator of molluscs is in the Invertebrate Zoology Section of the Zoology Division. He is responsible for intramural research in malacology and the supervision of extramural contractees). The policies follow the functions outlined in our Act.

(g) Major hindrances are the scarcity of technical support staff, the scarcity of sophisticated research equipment

and facilities, the general scarcity of storage facilities (cabinets), the lack of funds for research support, the long delays in publication of reports through the facilities of the Queen's Publisher, and above all the small research staff available to respond to the challenging demands of expanding science, and public inquiries.

(h) Some of the major desirable changes in organization within the next five years have been listed in paragraphs 22 to 29 and 31. In addition it would be desirable to split the research and curatorial functions to permit research scientists to pursue studies in theoretical studies such as numerical taxonomy while junior scientists supervised the collections and made routine identifications. All plans for expansion unfortunately must be postponed for two years or more as a result of the current staff freeze.

Unofficial discussions have taken place concerning the possibility of transferring the Entomology Research Institute to the Museum because of the clarity of the pure research functions expressed in the National Museums Act which covers the similar functions of E.R.I. If the Museum had satisfactory research facilities to offer, it would appear reasonable to transfer both E.R.I. and the taxonomy section of the Plant Research Institute to the jurisdiction of the National Museums of Canada Corporation under section 6 (e) of the Act (the inclusion of other museums).

- 2.3 Personnel Policies. (a) We prefer to hire experienced museum curators rather than members of the graduating classes. In any event the number of museum professionals is extremely small and we usually learn of them directly by application for employment, or from museum colleagues. When a vacancy occurs, applications are collected and transmitted to the Public Service Commission which arranges an appraisal board. The applicants are usually interviewed and a successful candidate chosen through regular P.S.C. procedures. The main problem in the museum personnel field is finding qualified Canadian applicants. Up to this time there is no Canadian university which offers specialized courses for curators of science museums. (I understand that the Royal Ontario Museum and the University of Toronto are planning in co-operation such a course at the Masters level.

This is a commendable project and merits support). Therefore we are obliged to look for graduates of foreign universities. Museums are therefore more involved in talent transfusions to the Canadian scene rather than in "the brain drain".

(b) Creative researchers are usually recognized on the basis of their published papers, and motivation observed during interview. The confidential appraisals of colleagues are also used.

(c) Staff with high potential for research administration are recognized on the basis of their performance. Factors such as objectivity in their reports, ability to supervise team research projects, and ability to submit position papers on research areas are good indicators. We have no positions classified as research managers because of an arbitrary decision by the Bureau of Classification Review that our divisions were too small to merit research managers. Therefore our division chiefs are classified as research officers and feel that they are not being rewarded for their administrative loads while at the same time their research productivity is restricted.

(d) Education leave to complete advanced degrees is a regular policy.

2.4 The regional pattern of scientific activities.

The Museum is interested in the flora, fauna, fossils and mineral occurrences of all of Canada. Quite naturally some studies are restricted to suitable areas: for instance marine biologists undertake field investigations in coastal areas and the best dinosaur-bearing sediments are found in Alberta. Generally our field activities are directed to areas where there are gaps in our knowledge. For that reason the Arctic regions receive relatively more attention than southern areas. We are also interested in regions contiguous to Canada such as the United States, and the Pacific and Atlantic Oceans.

The following table lists the number of museum expeditions to the provinces and territories since 1962:

Special Committee

Newfoundland	6	Alberta	20
Nova Scotia	9	British Columbia	26
Prince Edward Island	1	Yukon Territory	10
New Brunswick	4	Northwest Territories	12
Quebec	14	Extraterritorial	31
Ontario	19		
Manitoba	13		
Saskatchewan	10		

The Canadian Oceanographic Identification Centre (C.O.I.C.) was established within the Division of Zoology, Museum of Natural Sciences, in 1967, as the result of a recommendation by the Marine Productivity Subcommittee of the Canadian International Biological Programme Committee. It is a national sorting and identification service centre for zooplankton and fish larvae and eggs, and will be extended for benthos and phytoplankton in due time. Many oceanography-oriented institutions have made usage of the service since the establishment of the C.O.I.C. The service has relieved the scientists who are most interested in the ecology and the productivity of the sea from a great burden of taxonomy. The following table gives the requests of service that we have received to date and also reflects the pattern of scientific activities of Canadian biological oceanographers:

Organization & Project Leader	Lots of Samples	Area Studied	Type of Service requested
FRB, St. John's Dr. A. May	190	Newfoundland & Labrador coastal water	Identification of zooplankton.
Bedford Institute of Oceanography Dr. R.J. Conover	36	Gulf of St. Lawrence	Identification of zooplankton and determination of stages of life cycle of euphausiids and copepods.
FRB, St. Andrews Dr. B. Barrett	294	Bay of Fundy, Gulf of Maine & Nova Scotia coastal water	Measurement and identification of fish larvae, identification of zooplankton.
FRB, St. Andrews Dr. A.C. Kohler	65	Gulf of St. Lawrence	Identification of zooplankton and fish larvae.

Organization & Project Leader	Lots of Samples	Area Studied	Type of Service requested
FRB, St. Andrews Mr. T. Platt	63	St. Margaret's Bay	Identification of zooplankton.
FRB, St. Andrews Dr. W.J. Ross	564	Nova Scotia coast & Gulf of St. Lawrence	Identification of zooplankton and fish larvae.
Ontario Lands & Forests, & C.O.I.C. Dr. D.J. Faber	129	Lake Huron	Identification of fish larvae.
FRB, Nanaimo Dr. T.H. Butler	174	Strait of Georgia	Sorting and identification of decapod and fish larvae.
FRB, Nanaimo Mr. A.J. Dodimead	86	B.C. coast	Identification of zooplankton.
FRB, Nanaimo Mr. R.J. LeBrasseur	476	Pacific Station 'P'	Identification of zooplankton, determination of biomass (wet weight) & numerical composition of plankton samples.
FRB, Nanaimo Dr. M. Waldichuk	14	B.C. coast	Identification of zooplankton.
University of British Columbia Dr. B.M. Bary	1387	Indian Arm, B.C.	Sorting and identification of zooplankton (low priority).
Bellairs Research Institute Dr. J.B. Lewis	169	Barbados	Sorting and identification of zooplankton (low priority).

Not listed in the above table is the IBP Gulf of St. Lawrence
Project. Dr. D.M. Steven, leader of this project, has already
indicated the need of service but has not given the type of service
in detail.

2.5 Personnel associated with scientific activities.

(a) Current personnel establishment

47

Employees on strength by category

Director	1
Physical Sciences	1
Scientific Research	13
Biological Scientists	6
General Technical	12
Engineering and Scientific Support	6

Special Committee

Drafting and Illustration 2

Administrative Support 5

TOTAL

46

- (b) Number of professional staff devoting time
to administrative duties 1

- (c) Tabulated information regarding professional staff

<u>Bachelor Degree</u>	i	ii	iii	iv	v	vi
Godfrey, W.E.	Canada	Canada	Canada	14yrs	2lyrs	58 English only
MacDonald, S.D.	Canada	Canada	USA	21	9	41 English only
Smith, M.F.I.	Canada	Canada	Canada	27	2	49 English only

Master Degree

Baldwin, W.K.W.	Canada	Canada	Canada	36	21	58 English only
Cook, F.R.	Canada	Canada	USA	14	8	33 English only
Harington, C.R.	Canada	Canada	Canada	17	3	35 English only
Rafi, F.	Pakistan	Pakistan	Pakistan	13	3	35 English only
Youngman, P.M.	USA	USA	USA	12	8	41 English only

Doctorate

Banfield, A.W.F.	Canada	Canada	USA	26	15	50 yes
Bousfield, E.L.	Canada	Canada	USA	-	18	42 English only
Brodo, I.M.	USA	USA	USA	10	3	33 English only
Clarke, A.H.	USA	USA	USA	10	9	42 English only
Faber, D.J.	USA	USA	USA	10	1	36 English only
Ireland, R.R.	USA	USA	USA	10	2	36 English only
Lee, R.K.S.	Hawaii	Hawaii	Canada	22	2	37 English only
McAllister, D.E.	Canada	Canada	Canada	15	10	34 yes
Powell, N.A.	New Zealand	New Zealand	Austria	4	3	31 English only
Russell, D.A.	USA	USA	USA	13	3	31 English only
Scoggan, H.J.	Canada	Canada	Canada	33	21	57 English only
Shih, C.T.	China	China	Canada	10	1	34 English only
Soper, J.H.	Canada	Canada	USA	25	1	52 yes

(d) <u>Staff degrees</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Bachelor	3	3	3	3	3	4	4
Master	2	2	2	2	4	4	4
Doctorate	6	6	6	6	9	11	14

<u>Estimate</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Bachelor	4	6	7	9	11
Master	4	5	7	8	10
Doctorate	8	10	11	13	15

(e) <u>Turnover</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
	-	-	-	1%	-	1%

(f) <u>Previous experience</u>	<u>Industry</u>	<u>University</u>	<u>Prior Dept. or Agencies</u>	<u>Other Federal Agencies</u>
Bachelor	25%		25%	75%
Master	25%	75%		50%
Doctorate	7%	42.8%	21.6%	42.8%

(g) 1 employee with Masters degree - currently on educational leave.

(h)	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
		5	9	11	9	13

2.6 Expenditures associated with scientific activities

- (a) It is very difficult to obtain accurate figures because the information requested does not follow usual analysis in departmental estimates. The following information was obtained from the Dominion Bureau of Statistics Federal Government Expenditures on Scientific Activities.

Functions: in thousands

Year	(1) Intramural R. and D.	(2) Scientific Data Collection	(3) Scientific Information	(6) Support of R. and D. in Univers- ities
1962-63	141	261	25	25
1963-64	294	261	156	11

Special Committee

Year	(1) Intramural R. and D.	(2) Scientific Data Collection	(3) Scientific Information	(6) Support of R. and D. in Universities
1964-65	284	312	187	9
1965-66	308	334	199	31
1966-67	476	601	361	55
1967-68*	691	762	457	57
1968-69*	790	750	460	93

-* Estimated

Scientific discipline. All of the above-figures should be listed under (2d) biological sciences with the exception of \$100,000 R. and D. in 1968/69 which should be listed under (2h) oceanography. I have included palaeontology in biological sciences but it might be argued that it should be in (2j) earth sciences.

Areas of application. These funds could be applied to (4) agriculture, (8) health and (14) educational techniques and policies.

- (b) Operating and Capital expenditures by units. I regret that it is only possible to supply total agency figures. These figures relate to cost of administering the unit. Projected figures are theoretical because of current "freeze". Figures are in thousands.

<u>Year</u>	<u>Operating</u>	<u>Capital</u>
1962-63	52	nil
1963-64	77	-
1964-65	101	-
1965-66	139	-
1966-67	168	-
1967-68	354	-
1968-69	294	-

- (c) Funds expenditure for further professional university education:
1965-69, \$3,000; 1968-69, \$5,000.

2.7 Research Policies

- (a.1) Intramural Units. See reply to 2.2(d) how scientific goals are selected. Monitoring is mainly supplied by (1) acceptance by the scientific community of findings published in scientific reports, (2) acceptance by other departments of reports (identifications). Logistic co-operation has been supplied by Department of E.M.R. Polar Continental Shelf Project, Geological Survey of Canada as well as by Fisheries Research Board and Canadian Wildlife Service (see 2.2 c)
- (a.2) Priorities are established in committee with division chiefs based upon outside requests for action and funds available in the Estimates.
- (a.3) The programmes are too small for the application of CPN or PERT and we do not have the personnel to conduct the analyses.
- (a.4) There is a regular program of awarding professional service contracts to support intramural R. and D. The funds expenditure have been listed in 2.6(a) under item 6. The general policy is described in para. 26 and 37 of the main brief and discussed under section 2.2(c) of the appendix. The disciplines supported are systematic biology and palaeontology. An analysis of Extramural R. and D. performers (Sectors) is listed below (data from the Education Support Branch of the Secretary of State), in thousands.

Year	Fellowships	Can. Educ. Institutes	Other Canadian	Foreign
1964-65		-	39	-
1965-66		-	65	-
1966-67		24	29	6
1967-68		35	37	11
1968-69	25	30	32	5

(a.5) Extramural research projects are commissioned by means of professional service contracts. The contracts fall into two main groups (1) applications for support of research projects submitted by university professors and students, (2) mission-oriented projects suggested to independent investigators. As an example of (2) we have contracted to a retired minister, who is also a world renowned authority on a family of clams, to identify our collection of these clams. Applications received under (1) are reviewed by an internal committee of specialists and contracts are issued on the basis of merit and availability of funds. Our program complements the university grant program of N.R.C. (see 2.2(c)). It is not duplicated by any other department.

(a.6) Research resources are shifted when appropriate. Programs are terminated when completed. Professional service contracts are terminated when the project fails to meet requirements. Examples of such failures are: failure to submit report, or the submitted report was not up to standards. Changing research environment necessitates programme changes. As an example: several foreign researchers showed the importance of ethological studies (animal behaviour) in determining systematic relationships. We therefore shifted a curator from taxonomic ornithology to vertebrate ethology where he has made significant contributions during the past three years. He is now considered a leader in the field in Canada.

(a.7) Intramural and extramural research reports are transferred by the publication of papers, by the presentation of papers at conferences, by the sponsorship of specialized symposia and by the submission of manuscript research reports to inquirers.

2.7 (b) We have no units exclusively concerned with extramural research activities.

(b.8) All funds made available for the support of extramural research was actually expended each year.

(b.9) Percentage of total funds requested which were granted in

1962-63	?
1963-64	90
1964-65	80
1965-66	75
1966-67	70

2.8 Research Output

1) N/A

2) Books and journal articles arising from research activities.

The Museum staff publishes in the Museum's bulletin and paper series, as well as in scientific journals. Following is a list of staff publications since 1962.

List of books or journal articles arising from research activities - 1962 - 1967, inclusive.

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Baldwin, W.K.W. 1964. "Hudson Bay Lowlands," pp. 87-92 in A Naturalist's Guide to Ontario. (Edited by W.W. Judd & J.M. Speirs) Univ. of Toronto Press.

Brodo, I.M. 1965. Studies of growth rates of corticolous lichens on Long Island, New York. The Bryologist 68(4): 451-456.

Imshaug, H.A. & I.M. Brodo 1966. Biosystematic studies on Lecanora pallida and some related lichens in the Americas. Nova Hedw. 12(1,2): 1-59.

Schauer, Th. & I.M. Brodo 1966. Lecanora insignis und L. degelii. Nova Hedw. 11(1-4): 527-533.

Brodo, I.M. 1966. Lichen growth and cities: a study on Long Island, New York. The Bryologist 69(4): 427-449.

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- Brodo, I.M. 1967. Lichens of the Ottawa area. I. Trail & Landscape 1(2): 40-45. (litho.).
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- Crum, H.A. 1966. Bryophytes of Owen Sound and the Bruce Peninsula, Ontario. *National Museum of Canada Bulletin* 216: 102-122.
- Crum, H.A. 1966. A taxonomic account of the genus Thelia. *National Museum of Canada Bulletin* 216: 123-127.
- Ireland, R.R. 1966. Dicranum pallidisetum in western North America. *The Bryologist* 68: 446-450.

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- Ireland, R.R. 1967. Chromosome studies on mosses from the State of Washington, II. The Bryologist 70(3): 335-338.
- Lee, Robert K.S. 1966. Development of marine benthic algal communities on Vancouver Island, British Columbia. In The evolution of Canada's flora. Edited by R.L. Taylor and R.A. Ludwig. University of Toronto Press. p. 100-120.
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Palaeontology Division

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3) Routine requests for identifications submitted by individuals, university staffs, other government departments and foreign scientists are answered by telephone, letter, or report. All these requests probably number a hundred or more per month and are too numerous to enumerate here.

4) It is normal policy to send scientists to conferences in their disciplines to represent the Museum, to present papers, to keep abreast of international developments in their field, to make contacts with colleagues in their field and, finally, to prepare a report on their conference attendance. Listed below are conferences attended since 1962.

Canadian Scientific Societies

Annual Meeting of the Canadian Museums Association - 1964, 1965, 1966, 1968.

Annual Meeting of the Canadian Society of Zoologists - 1963, 1964, 1966, 1967, 1968.

Annual Meeting of the Royal Society of Canada - 1962, 1965, 1967.

Northeast Fish and Wildlife Conference - 1967.

Annual Meeting of Canadian Society of Fisheries and Wildlife Biologists - 1962, 1963, 1964, 1965.

Annual Meeting of the Arctic Institute of North America - 1963, 1966.

Federal-Provincial Wildlife Conference - 1966.

Symposium on Grouse Research - 1965, 1966.

Annual Meeting of the Computer Society of Canada - 1968.

Meeting of the Canadian Committee on Oceanography - 1967.

Annual Meeting of the Canadian Botanical Association - 1964, 1965, 1966,
1967, 1968.

Canadian Geological Association - 1965, 1966, 1967, 1968.

American International Societies

Annual Meeting of the American Ornithologists' Union - 1962, 1965, 1966,
1967, 1968.

Annual Meeting of the American Association for the Advancement of Science -
1962, 1964, 1966, 1967.

Annual Meeting of the American Society of Mammalogists - 1963, 1964, 1965,
1966, 1967.

Annual Meeting of the American Malacological Union - 1963, 1964, 1966, 1967,
1968.

Annual Meeting of the American Society of Ichthyology and Herpetology -
1962, 1963, 1964, 1965, 1967.

Annual Meeting of the American Society of Limnology and Oceanography -
1963, 1964, 1966, 1967.

Annual Meeting of the American Institute of Biological Sciences - 1965,
1966, 1967, 1968.

Annual Meeting of the American Association of Museums - 1964, 1967.

Annual Meeting of the Association of Science Museum Directors - 1964, 1966,
1967.

Annual Conference of Directors of Systematic Collections - 1964, 1965, 1966,
1967, 1968.

Annual Meeting of the American Society of Vertebrate Palaeontologists -
1965, 1966, 1967.

International Congresses

Congress of the International Council of Museums - 1965, 1968.

Pacific Science Congress - 1962, 1966.

European Malacological Congress - 1962, 1965, 1968.

International Congress of Zoology - 1963.

International Congress of Limnology - 1962, 1965, 1968.

Special Committee

International Ornithological Congress - 1962, 1966.

International Conference on Bryozoology - 1968.

International Ethological Conference - 1967.

International Association of Biological Oceanography - 1968.

International Congress on Quaternary Research - 1965.

International Geological Congress - 1968.

Special Symposia

Conference on the Physiology and Evolution of the Crustacea - Harvard,
1962.

Special Conference on Problems in Malacology - Smithsonian Institute,
1963.

Symposium on factors affecting the distribution of Arctic plants and
animals - Nat. Mus. Can., Ottawa, 1964.

Conference on the Limnology of Lake Champlain - Burlington, Vt., 1965.

Committee for the Scientific Exploration of the Atlantic Shelf (SEAS) -
Washington, 1966, 1967.

Colloque, Problemes actuels de palaeontologie - Paris, 1966.

Symposium on the productivity of St. Margaret's Bay - Bedford Institute
of Oceanography, 1967.

Symposium on application of automatic data processing methods in the
natural sciences - University of Mexico, 1967.

Symposium of Scientific Committee on Oceanic Research (UNESCO) on
preservation of zooplankton - Washington, 1968.

Symposium on role of museums in support of systematic research in Canada -
University of Toronto, 1968.

International Permafrost Conference - Purdue Univ., 1963.

Symposium on Terrestrial Ecology - St. Francis Xavier University, 1966.

Symposium on Ethnobotany - Yale University, 1966.

5) Information is transferred extramurally by lectures and
correspondence.

6) During the period under discussion only one curator has resigned
to accept a professorship at an American university. He had undoubtedly

gained a good international reputation through his research at our institution.

7) An important research team is to be found among the staff of the Canadian Oceanographic Identification Centre which can be of great benefit to Canadian oceanographic surveys. Others curators have acted on extramural research teams in pollution and public health.

8) Valuable research tools added during the period include: X-ray instruments for study of skeletons, desk computers, automatic data input machines, chromosome cytology laboratory and a sound spectrograph.

9) It is difficult to appraise quantitatively the impact of the Museum's scientific output on advancement of knowledge and on Canada's economic development, since the Museum's activities are mainly in the pure science area. As far as advancement of knowledge is concerned, our publications are deposited in the libraries of approximately 500 universities, museums and research institutes. Our publication titles are often listed in authors' literature references. Some of our books are used as texts for university courses, others are standard reference texts in popular demand such as W.E. Godfrey's Birds of Canada, 1966. Our scientists are well known in scientific circles and several hold executive positions in scientific societies. Many are internationally recognized specialists in their fields.

Our impact on Canada's economic growth is indirect through research on an inventory of Canada's terrestrial and marine resources as well as research on the quality of the human environment in such research areas as agricultural pests, pollution and public health surveys. One fact is of economic significance. Lack of information on the identity, distribution and populations of our natural resources could lead to loss of income in the long run. Misidentifications of potential resources, pests, or research material can be costly in the first instance.

We also serve as an important interface with the community in the field of scientific education through our popular lectures, day camps, junior naturalist clubs, exhibitions and school loan exhibits.

10) The Museum tries (within its inadequate budget) to represent Canadian federal activity in the important international museums sphere of culture and science.

2.9 Projects

1) List of Titles or other brief descriptions of projects, 1962-1967.

Botany Division

A. Completed Projects

1. Flora of the Canadian Arctic Archipelago. 1962-1964. A.E. Porsild
2. Revision of the genus Antennaria in eastern arctic and subarctic America. 1962-1965. A.E. Porsild.
3. Flora of the Southwestern Yukon Territory. 1962-1966. A.E. Porsild.
4. Revision of the genus Cerastium in North America. 1962-1967. A.E. Porsild.
5. Flora of the Clay Belt region of northern Ontario and Quebec. 1962. W.K.W. Baldwin.
6. Taxonomic Revision of the genus Plagiothecium for North America, north of Mexico. 1966-1967. R.R. Ireland.
7. Lichens of the Ottawa region (foliose and fruticose species). 1965-1967. I.M. Brodo.

B. Continuing Projects

1. Flora of the Alberta portion of the Rocky Mountains. 1962-1967. A.E. Porsild.
2. Flora of the Continental Northwest Territories. 1962-1967. A.E. Porsild (in collaboration with W.J. Cody, Plant Research Institute).
3. Studies on the flora of the Boreal Forest Region of Canada (Upper English River Section, Hudson Bay Lowlands Section, Mixedwood Section and Nichicun Lake in Quebec). 1962-1967. W.K.W. Baldwin.
4. Flora of Eastern and Central Canada. 1962-1964. H.J. Scoggan. This project was enlarged and continued under the revised title Flora of Canada. 1965-1967. H.J. Scoggan. A major work on the

native and naturalized vascular plants of Canada, Alaska and Greenland, which will contain descriptive "keys" for the identification of some 5000 species of flowering plants.

5. Revision of the North American species of the Lecanora subfusca group. 1965-1967. I.M. Brodo.
6. Monograph of the North American species of the lichen genus Pertusaria. 1965-1967. I.M. Brodo.
7. The lichens of the Queen Charlotte Islands. 1967. I.M. Brodo.
8. Checklist of the Mosses of Canada (a co-operative project with other Canadian bryologists). R.R. Ireland.
9. Mosses of the Maritime Provinces of Canada. 1967. R.R. Ireland.
10. A morphological study of moss Pseudoparaphyllia. 1966-1967. R.R. Ireland.
11. A systematic and phytogeographical study of the marine benthic algae of the Canadian Arctic. 1967. R.K.S. Lee.
12. A morphological and phylogenetic study of the melobesioid algae (Corallinaceae). 1966-1967. R.K.S. Lee.
13. Checklist of marine algae of Canada (a co-operative project with other Canadian phycologists). 1967. R.K.S. Lee.
14. The Flora of Ontario: Distribution of the Vascular Plants. 1967. J.H. Soper.
15. Manual of the Shrubs of Ontario. 1967. J.H. Soper (in collaboration with M.L. Heimbürger, University of Toronto).
16. Application of data processing methods to herbarium procedures (i.e. recording, storage and retrieval of botanical information, semi-automatic production of specimens labels and machine-plotting of distribution maps). 1967. J.H. Soper.

Palaeontology Division

1. Completion of revision of North American mosasaurs.
2. Description of Cretaceous vertebrates from arctic Canada.
3. Description of dinosaur faunas of southern Alberta - this is the most important and largest project.
4. Pleistocene mammals of the Yukon Territory.

5. Evolution and distribution of Pleistocene muskoxen of the genus Ovibos.
6. A bibliography and catalogue of Canadian Pleistocene vertebrates.
7. A biostratigraphic study of Pleistocene non-glacial deposits at Fort Qu'Appelle, Saskatchewan.
8. The postglacial vertebrate fauna of the Champlain Sea.

Zoology Division

<u>Project</u>	<u>Category</u>
1. Post-glacial Dispersal of Littoral Marine Invertebrate of the Canadian Atlantic Region.	Major: MS near completion.
2. Shallow-water Invertebrates of the Gulf of St. Lawrence and Eastern Nova Scotia regions.	Major: MS in preparation.
3. Shallow-water Crustaceans of the Gulf of Maine region.	Major: MS in preparation.
4. Amphipod Crustaceans of Sable Island, Nova Scotia.	Minor: MS completed.
5. The Haustoriidae of New England (Crustacea: Amphipoda).	Major: Published 1965.
6. Adaptive Radiation in Sand-burrowing Amphipod Crustaceans.	Medium. MS completed.
7. Revision of Sand-burrowing Amphipods of the family Dogielinotidae.	Major: Partly published (1967) by another author.
8. Haustoriidae of the South-eastern and Gulf States.	Major. In preparation.
9. Shallow-water Amphipod Crustaceans of the south-eastern and Gulf States.	Major. In preparation since 1963.
10. New Beach Hoppers from the Gulf States of the USA.	Minor: MS in preparation.
11. The Amphipod Genus <u>Gammarus</u> in the Middle Atlantic States.	Major. In press.
12. Check-list of Gammaridean Amphipod Crustaceans of the Canadian Region.	Medium. MS completed.
13. Animal Life in Canada Today. General Invertebrate and Arthropods.	In press.

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| 14. Studies on Littoral Marine Invertebrates of the Canadian Pacific region, 1955-1966. | Major. 3 station lists published. |
| 15. Amphipod Crustaceans of the Pacific Coast of Canada. Families Gammaridae, Haustoriidae, Talitridae, Hyalidae, Dogielinotidae. | Major. In preparation. Continuing. |
| 16. Talitridae of the Western Atlantic Region. | Major. Plates complete. |
| 17. Shallow-water Amphipod Crustaceans of New England. | Major. Since 1963. MS near completion. |
| 18. The Land Amphipods (Talitridae) of Australia. | Major. Since 1962. MS completed. |
| 19. Fresh-water and Terrestrial Amphipods of the Noona Dan Expedition of the Bismarck Archipelago and Rennell I. | Major. MS near completion. |
| 20. Talitridae of Campbell I., Sub-Antarctic Islands of New Zealand. | Medium. Published 1964. |
| 21. Talitridae of South Africa (with E. Dahl, Sweden). | Medium. In preparation since 1962. |
| 22. Terrestrial Adaptations in Crustacea - Amphipoda. | Minor. MS submitted. |
| 23. New Records of Talitrid Amphipods from California. | Minor. Published 1967. |
| 24. Estuarine Amphipods from Prince William Sound, Alaska. | Minor. Published 1968. |
| 25. Stomach Contents of Gray Whale, Alaska. | Minor. In preparation. |
| 26. A Fresh-water <u>Gammarus</u> from Western Texas. | Minor. In press. |
| 27. Fresh-water Amphipods from Florida. | Medium. Published 1963. |
| 28. Freshwater molluscs of the Hudson Bay and Canadian Arctic Watersheds. | Nearly completed. |
| 29. Revision of three Families (Lacunidae, Aciculidae, and Sequenziidae) for the Treatise on Invertebrate Zoology. | In press (Lacunidae and Aciculidae) and underway (Sequenziidae). |

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| 30. Rare and Endangered North American Mollusca. | Underway. |
| 31. The ecology of <u>Acroloxus coloradensis</u> in eastern Canada. | Nearly completed. |
| 32. Studies on Pleistocene, Lake Iroquois, southern Ontario. With P.F. Karrow. | In final draft. |
| 33. Fishes of the Arctic coast of Canada. A scientific study on our northern marine fishes to be co-authored with Dr. J.G. Hunter of the Fisheries Research Board. | In progress. |
| 34. Evolution of scales in teleostome fishes. A scientific study on the scales of bony fishes, to be co-authored with Dr. T. Uyeno of Tokyo. | In progress. |
| 35. Guide to the freshwater sportfishes of Canada. A popular guide to be published in French and English. | Now in manuscript. |
| 36. Key to amphibians and reptiles of Canada. | In progress. |
| 37. Analysis of the herpetofauna of the Canadian prairies. | In progress. |
| 38. Herpetile collections from Jamaica. | In progress. |
| 39. A morphological, ecological, behavioral and cytogenetic study of hybridization of the toads <u>Bufo americanus</u> and <u>Bufo Hemiophrys</u> in Manitoba. | In progress. |
| 40. Identification of the salamander <u>Ambystoma tremayi</u> , new to New Brunswick. | In progress. |
| 41. Information sheets on amphibians and reptiles of Saskatchewan. | In progress. |
| 42. Bryozoa of North New Zealand. | |
| 43. Bryozoa of the South Red Sea. | |
| 44. Bryozoa of the Bay of Fundy Region. | |
| 45. Intertidal Bryozoan Fauna of coastal British Columbia. | |
| 46. Trans-migration of Red Sea Bryozoans into the Eastern Mediterranean. | |
| 47. A taxonomic revision of <u>Dicrostonyx torquatus</u> in North America. | |

48. The Mammals of Yukon Territory.
49. Insular populations of Microtus pennsylvanicus
from northeastern North America.
50. A revision of Clethrionomys rutilus in Canada.
51. Serum protein electrophoresis and systematics of
the Arctic Ground Squirrel.
52. The cytotaxonomy of Arctic mammals.
53. The Birds of the Dease Lake - Telegraph Creek and
Cassiar Mountains. (B.C.) 1962.
54. Ethology of Blue Grouse - a study correlating
behaviour patterns with habitat selection in the
foothills of the Rocky Mountains. (Alberta). 1963.
55. The Birds of the Lytton, Lilloet and Williams Lake
areas in British Columbia. 1964.
56. (1) Ethology of Blue and Franklin's Grouse. 1965.
(2) The Birds of Banff, and Waterton Lakes National
Parks (Alberta). 1965.
57. Ethology of Blue and Franklin's Grouse (Alberta). 1966.
58. Courtship and Territorial Behaviour of Grouse (Alberta,
British Columbia, Kansas, U.S.A., Forserum, Sweden,
Banchory, Scotland). 1967.
59. Ethological and Zoological research at Bathurst
Island, N.W.T. 1968.
60. Geographic variation in Zonotrichia leucophrys, Strix
varia, Hylocichla guttata, Plautus alle, Anser albifrons
(in co-operation with a Washington ornithologist), and in
the Branta canadensis hutchinsii-parvipes complex.
61. The affinities of the gulls Larus thayeri, glaucooides,
and argentatus.
62. The status of Larus schistisagus in Canada. Published.
63. The status of Himantopus mexicanus in Canada. In press.
64. Schizochroism in several bird species. Published.

Special Committee

65. Biology of the freshwater whitefish of Lake Huron.
 66. Methods of freshwater larval fish study.
 67. Computerization of museum collection.
 68. Taxonomy dictionary of Canadian fauna.
 69. Behaviour of larval golden shiners (in co-operation with D. Shepard of Ontario Department of Lands and Forests).
 70. Fish larvae and eggs of Nova Scotia coastal water.
 71. A revision and biological study of an amphipod family, Phronimidae. 1962-1966.
 72. Systematic and ecological study of the Hyperiidea in the adjacent waters of Barbados. 1966 - .
 73. A compilation of systematic list of the Hyperiidea (Crustacea: Amphipoda) since 1888. 1968 - .
 74. The Phronimidae collected by the United States Antarctic Research Project 1968 - .
 75. A revision of the giant isopod genus, Bathynomous 1968 - .
 76. A new species of the genus Monstrilla (Copepoda: Monstrilloidea) 1968 - .
 77. The Hyperiidea of the North Pacific Ocean in the Lamont Geological Observatory collection. 1968 - .
 78. The Hyperiidea collected from transactions from North America to Sargasso Sea 1968 - .
 79. Identification manual of coastal zooplankton of Nova Scotia.
- 2) The most significant completed projects of the last five years, 1963 - 1967, inclusive. - Basic Research.

Botany Division

1. Flora of the Canadian Arctic. - The revision of the "Illustrated Flora of the Canadian Arctic Archipelago" (218 pages) by A.E. Porsild in 1964 made available once more an internationally recognized reference on the vascular plants of one of the most important areas in Canada.

This is an example of a book based on many years of field experience and museum research which presents in concise form information needed for the identification of indigenous plants within a large geographic area. The "Flora" contains descriptions and "keys" for identification as well as illustrations and distribution maps showing the known ranges of the plants described. It is a model for this type of publication, i.e. a field guide and identification manual.

2. Revision of the genus Antennaria. - Although the publication in 1965 of this monograph occupied only 34 pages in a botanical journal, the results were based on careful field observations and painstaking research on herbarium specimens spread over several years. The genus Antennaria is one of the most difficult groups of flowering plants in Canada's flora and has long been in need of an "in-depth" study. The revision by A.E. Porsild contains descriptions and a key, together with notes on the ecology and distribution (with maps) of the 18 species of Antennaria recognized by him as native to eastern arctic and subarctic North America, including Greenland. It also contains an evaluation of the diagnostic characters helpful in separating members of this critical genus. Before the flora of Canada is completely understood, there will have to be more monographic studies of this type in many groups of flowering plants as well as in the mosses, lichens and algae.
3. Contributions to the Flora of the Southwestern Yukon Territory. - This publication (86 pages) by A.E. Porsild appeared as the first paper in a recent series issued by the National Museum of Canada under the title "Contributions to Botany IV". It was intended primarily as a report of significant additions or range extensions to the vascular flora of southwestern Yukon since the publication of Hultén's "Flora of Alaska and Yukon" (1940 - 1950) and Porsild's "Botany of Southeast Yukon" (1951). It deals with 267 taxa (kinds of plants) and contains discussions of the ecology and taxonomic status of some critical or

little known species of that region, together with distribution maps for over 160 species.

This is an example of a careful regional study of the type which forms the basis for phytogeographic studies of wide scope. The citation of actual specimens preserved in the research collections of the National Herbarium makes this a valuable reference to botanists, both to those working on the flora of western North America and to those doing monographic studies on vascular plants which occur in that area.

4. Lichens of the Ottawa Region. - Two groups of lichens (foliose and fruticose species) have been covered in the first two articles published in 1967 by I.M. Brodo in a popular journal read by local naturalists and, no doubt by professional biologists as well, in the Ottawa region. These articles explain the structure of those interesting plants known as lichens and provide descriptive "keys" for the identification of the species commonly found in the Ottawa district.

These short papers represent an attempt to interpret the work of specialists to the laymen, to stimulate further the interest of naturalists in the native flora of their own local area and to provide them with a means of broadening their interests and pursuing particular lines of scientific enquiry to greater lengths.

Zoology Division

1. The Birds of Canada by W. Earl Godfrey

"The Birds of Canada" has been enthusiastically received by both amateur and professional bird students in Canada and elsewhere as evidenced by uniformly favorable reviews (in various countries), newspaper articles and editorials, hundreds of letters, and by sales. It is frequently cited or quoted in the ornithological literature of the world and was recently included in the basic list (there were two other secondary lists) of ornithological works (22 in all, four North American) by the President of the International Ornithological Congress for use

by a committee of professionals in preparing a "Check-list of holarctic birds". Particularly useful to professionals is the mass of data on the status of each of the 518 species treated, as well as ecological information, taxonomic treatments, nomenclature, certain original species distinctions, and the most accurate compilation of incubation periods available for North American birds. Amateurs particularly like the range maps and identification aids.

Over 21,500 copies of the English edition of 29,000 copies have been sold, and ca. 2,380 copies of the French edition (of 9,000 copies). For at least two weeks it was the best seller among non-fiction books in the city of Toronto.

2. Annotated List and Bibliography of the Abyssal Marine Molluscs of the World. by A.H. Clarke, Jr., 1962. Bull. Nat. Mus. Canada No. 181, 114 pp.

This is the only annotated list and bibliography on deep sea molluscs of the world which has ever been published. Oceanographic laboratories, especially in the northern hemisphere, frequently consult this monograph concerning the identification and further study of the 1,152 species and subspecies living deeper than 1,000 fathoms. The catalogue also enables basic generalizations to be proposed on the composition, zoogeography, origin and age of the deep sea molluscan fauna.

3. Evolution of branchiostegals and classification of teleostome fishes. by D.E. McAllister. Bull. Nat. Mus. Can. (221) 1-239, 21 pls., 3 figs.

This study presents the only recent complete reclassification of living and fossil groups of bony fishes of the class Teleostomi. The Chondrostei, Holostei, and Teleostei are re-established and reconstituted as supra-ordinal groups. New interpretations are given in the phylogeny of the Teleostei with major realignment of ordinal and sub-ordinal groups. The monograph has been favourably reviewed recently in Nature 219 (5149): 11.

4. Polyzoa (Bryozoa) Ascophora - Cheilostoma from North New Zealand. by N.A. Powell, 1967. Discovery Reports.

This comprehensive study treats 100 species and 2 varieties of these sessile, colonial marine invertebrates from Northern New Zealand. Complete descriptions and figures are given for all species, including 1 new genus and 30 new species. The fauna is analyzed zoogeographically and divided into several components of which the largest group (one-third) is indigenous. As a result of this study the author was elected Fellow of the Linnaean Society of London, 1968.

5. Haustoriidae of New England (Crustacea: Amphipoda). by E.L. Bousfield, 1965. Proc. U.S. Nat. Mus. 117 (3512): 159-240.

This study embraces a heterogeneous group of sand-burrowing filter-feeding crustaceans of coastal north-eastern North America, including eastern Canada. The animals are probably the most common, ecologically most important, yet were taxonomically the least understood macro-invertebrates of American Atlantic beaches. They form an important food item of shore birds and fishes. Herein are described two new subfamilies (Pontoporeiinae and Haustoriinae), five new genera, and twelve new species, increasing the regional total to 10 genera and 20 species. This paper has formed the taxonomic basis for all other more recent ecological, behavioural, and life history studies on these animals.

APPENDIX 2

9th GENERAL ASSEMBLY OF ICOM9th August 1968

Motion 2

Museums and Research

ICOM,

Considering the reports presented to the 8th General Conference, and the discussions which followed,

Affirms the principle that museums are by nature scientific institutions and that consequently every museum which possesses qualified personnel and suitable material and technical means should promote, encourage, undertake or develop individual or collective scientific research, the field of which will be dictated by the museums' collections and programme,

Launches an appeal to the authorities and private or public administrations and institutions responsible for museums that they accord to museums their support and the necessary financial means for the purpose of scientific research,

Adopts the following principles and recommendations:

Personnel

In conformity with points 1 to 4 of the annexe to Motion 8 passed by the 7th General Conference, it is emphasized that museum scientific personnel responsible for research must possess the necessary qualifications and be accorded appropriate recognition. The lack of scientific personnel in museums of different categories is beginning to be felt and to cause harmful effects upon research. In order to remedy this situation, museum personnel should receive a status equal to that of staff in universities and other research institutions who possess similar qualifications and responsibilities. This solution would permit museums to retain on a permanent basis highly qualified research staff who at present too often find salaries and working conditions more attractive elsewhere.

If a museum is not in a position to maintain research workers on a regular basis in order to conduct the minimum of scientific work, it is desirable that it find means to have such activity conducted at least on a temporary basis by scientists from other museums, universities or centres of research.

The Museum as Research Institution

As Motion 4 passed by the 7th General Conference affirmed, it is of prime importance that the results of findings about collections be elaborated and published in the form of scientific catalogues and reports. Catalogues should be edited and published

Motion 2 (Cont.)

according to standards appropriate to each discipline particularly with regard to the description and interpretation of objects. It would be desirable to establish international standards for such tasks.

Experiments performed in a number of countries concerning the use of computers in museums have given interesting results and deserve to be continued on account of their importance for the future international collaboration of museums and above all for the contribution computers can make to research: facility, rapidity and precision of information.

Besides study of collections, research activities should be completed by programmes directed to the exterior: field missions on archaeology, ethnology, natural sciences, etc.

The Museum and other Institutions of Research

The tradition of cooperation, which has proven so fruitful, between museums and other scientific institutions, notably universities, is to be emphasized, maintained and developed. Museums should be readily open to researchers from other institutions, either for consultation or for participation in the staff's own work. Similarly, on an exchange basis, museum workers should have access to other institutions of research. In addition, museums should take a more active and permanent part in the planification and coordination of scientific research, whether on a national, regional or international level. In this manner museums will take part in collective research activities.

A grave problem arises in this connection which needs to be resolved in the framework of relations between museums and other institutions: the attribution of results obtained, and notably of objects collected, during study missions. Since museums have the specific function of collecting, classifying and conserving objects and documents, and of making them accessible, they should lend assistance to other institutions in this connection: by helping them make available the results of their research and to conserve and exhibit objects.

Recommendations to International Organisations

It is desirable that Icom, through the intermediary of its International Specialized Bodies, undertake the establishment of catalogue norms for museums of different disciplines, as well as their application, particularly in view of the possibility of the use of computers in the future.

It is proposed that Unesco envisage the publication in its magazine "Museum" of an article on the topic of "Information and Data Retrieval in Museums: Present and Future".

Motion 2 (Cont.)

Icom should in forthcoming years strengthen its connections with International Professional Organisations and the representatives of different scientific disciplines in order to arrange an exchange of views on problems affecting the Museums and Research.

INDEX DES CARTES DES POSSIBILITÉS DES SOLS POUR L'AGRICULTURE

INVENTAIRE DES TERRES DU CANADA

INDEX TO SOIL CAPABILITY FOR AGRICULTURE MAPS

CANADA LAND INVENTORY



PUBLICATION DE CARTES

MAP PUBLICATION

Publiées ☐ Published
En préparation ☐ In preparation

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First Session—Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*

The Honourable DONALD CAMERON, *Vice-Chairman*

No. 41

THURSDAY, APRIL 24th, 1969

WITNESSES:

Canada Council: Me Jean Martineau, Q.C., Chairman; Dr. David W. Slater, member and Dean, School of Graduate Studies, Queen's University; Jean Boucher, Director; and Frank A. Milligan, Assistant-Director and Head, Social Sciences and Humanities Division.

APPENDICES:

- No. 49—Brief submitted by Canada Council.
 - No. 50—Brief submitted by the National Film Board.
 - No. 51—Brief submitted by the Canadian Wheat Board.
 - No. 52—Brief submitted by Farm Credit Corporation.
-

THE QUEEN'S PRINTER, OTTAWA, 1969

MEMBERS OF THE SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—

Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—

Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

THURSDAY, April 24, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Aird, Blois, Cameron, Carter, Giguère, Grosart, Haig, Kinnear, Lang, Leonard, McGrand, Phillips (*Prince*), Robichaud, Sullivan and Yuzyk—(16).

The following witnesses were heard:

CANADA COUNCIL:

Me Jean Martineau, Q.C., Chairman;
Dr. David W. Slater, member and Dean, School of Graduate Studies,
Queen's University;
Jean Boucher, Director; and
Frank A. Milligan, Assistant-Director and Head, Social Sciences and
Humanities Division.

(A curriculum vitae of each witness follows these Minutes)

The following are printed as Appendices:

- No. 49—Brief submitted by Canada Council.
- No. 50—Brief submitted by the National Film Board.
- No. 51—Brief submitted by the Canadian Wheat Board.
- No. 52—Brief submitted by Farm Credit Corporation.

At 1:00 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Martineau, Jean, Q.C. (Montreal): Chairman of the Canada Council. Born in Montreal, 1895; son of the late Hon. P. G. Martineau. Education: St. Hyacinthe Seminary, St. Jean College and St. Laurent College; LL.L. University of Montreal; Hon. LL.D. Faculty of Law of the University of Montreal. Hon. LL.D. Faculty of Law of Laval University. Called to the Bar of the Province of Quebec in July 1919; Queen's Counsel in October, 1929. Bâtonnier of the Bar of Montreal and the Bar of the Province of Quebec, 1953-54. Senior partner in the law firm of Martineau, Walker, Allison, Beaulieu, Tetley and Phelan. Director of the Royal Trust Company, Monsanto Canada Limited, Chateau-Gai Wines Limited and a director of the Montreal Museum of Fine Arts. Appointed Chairman of the Canada Council in 1964.

Dr. John Francis Leddy (Windsor): Vice-Chairman of the Canada Council. President and Vice-Chancellor of the University of Windsor. Born in 1911 in Ottawa, but moved to Saskatoon at an early age. B.A. and M.A., University of Saskatchewan, post-graduate studies in classics at the University of Chicago, Rhodes Scholar at Exeter College, Oxford, (B. Litt. and D. Phil.). Joined the Department of Classics, University of Saskatchewan, in 1936, became head of the Department in 1946, dean of Arts and Science in 1949, and vice-president (academic) in 1961. Appointed president of the University of Windsor in 1964. Has held positions of leadership in a wide variety of public and educational societies in Canada, including chairmanship of the Educational Council of Saskatchewan, the Humanities Research Council of Canada, the Canadian Catholic Historical Association, the Canadian National Commission for UNESCO, Canadian University Service Overseas, World University Service of Canada. Is currently international vice-president of World University Service. Has travelled widely around the world and has been delegated to many international conferences and meetings. Author of a large number of special articles in the fields of university education, the ancient classics, and the history of ideas. Has received many honors, including honorary degrees from several universities, the Human Relations Award of the Canadian Council of Christians and Jews; the Cardinal Newman Award of the Canadian Federation of Newman Clubs, and several papal awards.

Slater, David W. (Kingston): Professor of Economics and Dean of the School of Graduate Studies, Queen's University. Born in Winnipeg in 1921. Educated at the University of Manitoba (B. Comm.), Queen's University (B.A., Honours in Economics) and the University of Chicago (M.A. and Ph.D.). Served in the Canadian Army in World War II. After lecturing at Queen's University and Stanford University, joined the staff of Queen's University in 1952 and was promoted to professor of economics in 1962. Has been Dean of the School of Graduate Studies since June 1968. Served on the staff of the Royal Commission on Canada's Economic Prospects (Gordon Commission), in 1955-56. Has published many articles on economics and has served on committees studying education, economics, university affairs and the social sciences. Is currently a member of the Committee of University Affairs and editor of the Canadian Banker's Magazine.

Boucher, Jean (Ottawa): Director of the Canada Council. Born in Quebec City in 1919. Educated at Garnier College, Quebec, Laval University (LL.L. and L.Soc.). Post-graduate studies in public administration at Chicago University as a fellow of the Department of Political Science. Lectured in political science at Laval University from 1946 to 1950. Joined the Department of Citizenship and Immigration, Ottawa, in 1950 as assistant to the Deputy Minister and Director of Administrative Services, and was appointed Director of Citizenship in 1957. Commissioner of the Civil Service Commission of Canada in 1963. Appointed Director of the Canada Council in April 1965. Has been head or alternate head of Canadian delegations to several international conferences, and was a member of the Council of the North West Territories from 1953 to 1957. Is a charter member of the Institut Canadien des Affaires Publiques and has served on the boards of various scientific and educational organizations including the Canadian Social Science Research Council, the Institut Canadien d'Education des Adultes, the Canadian Institute of Public Affairs, and the Overseas Institute.

Milligan, Frank A. (Ottawa): Assistant-director of the Canada Council and head of its Social Sciences and Humanities division. Born in Halifax in 1921. Educated at the University of Manitoba (M.A. in history and political science). After serving in the Canadian Army during World War II, lectured in political science at the University of Manitoba (1947-49), then studied for two years at the London School of Economics under a Beaver Club scholarship. Associate professor of political science at the University of New Brunswick (1951-54). Joined the office of the deputy minister of Defence Production, Ottawa, in 1954, and two years later became his executive assistant. Appointed research director of the Royal Commission on Government Organization in 1960, and assistant secretary to the Cabinet in 1963. Joined the Canada Council as assistant-director in December 1966. In the course of his career, has served on a number of Canadian delegations to international conferences. Has published several historical papers on the Government of Manitoba and has written on the British nationalized industries and on the financing of the Canadian Crown corporations. Played an important role in the drafting of the Glassco Commission Report on Government Organization.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, April 24, 1969

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (*Chairman*) in the Chair.

The Chairman: Honourable senators, I am sure you are all very pleased to welcome again the representatives of the Canada Council. You will remember that when we began our public hearings the Canada Council was the first agency interested in research and, in their case, mainly in research in the Social Sciences, to appear before us.

As a result of the continuation of our hearings, they felt that it might be desirable for them to add to their first presentation, so we are very pleased to have them with us again this morning.

You will also remember that when the Canada Council appeared before us for the first time, the Chairman, Monsieur Jean Martineau, was not able to be with us. We are very glad to have him here this morning, and I would like to mention that this is perhaps one of the last appearances of Mr. Martineau in his capacity as Chairman of the Council, since he has chosen not to seek reappointment.

I want to say that Mr. Martineau is an old friend of mine. I have admired what he has done all his life. He has been, really in the fullest sense of that expression, a great Canadian, always devoted to the public interest. So, we are very pleased to have you, sir, with us this morning along with your colleagues.

On my left is Dean David Slater, who is a member of the Council and the Dean of the School of Graduate Studies, Queen's University. On my extreme right is Monsieur Jean Boucher, who is the Director of the Council; and on my extreme left, Mr. Frank Milligan, who is Assistant Director of the Council, his main responsibility, as I understand, being in

the field of the Social Sciences and the Humanities.

So, without any further introduction, I would ask the Chairman, Mr. Martineau, to make a few introductory remarks.

Mr. Jean Martineau, Q.C., Chairman, Canada Council: Mr. Chairman, thank you for your kind words, which were no doubt inspired more by your friendship than anything else, but they were very pleasant to hear anyway.

The way this room is arranged, this is the first opportunity, and probably the last, I have of talking down to such an august body as this committee of the Senate, and we will try to make the most of it. We are happy to be here for the second time. On the first occasion I could not attend because I was then before the Supreme Court, in the middle of a case, and it was impossible for me to obtain permission to leave it to appear before you; but this time I would not have missed it for anything.

We are glad to be here and to give you any information you might desire, because we realize the importance of the work you are doing, and we think that potentially this work can be of great assistance to all science in Canada, to give it, if not a direction, anyway to lead it and to help it develop as it should.

We of the Canada Council have done, I think, our best, but we are always willing to listen and to follow when the leadership is good. So, we are here ready to answer any questions that you might put to us on the additional brief we submitted to you a few days ago.

The Chairman: Merci beaucoup, M. Martineau. We shall now proceed to the question period, and I will ask Senator Cameron to initiate the discussion.

Senator Cameron: Mr. Chairman, I am glad to know that I was in distinguished company by being absent from the previous meeting with the Canada Council. It was a matter of

deep regret to me that I had to be in the west at that time.

I would like to preface my questioning by saying that I am sure all thinking Canadians appreciate the tremendous role the Canada Council has played since its inception in 1957. It has probably been the most significant single contribution to the arts in Canada.

Having regard to the numbers of people who have received scholarships and study grants, the results of whose work has been injected into the Canadian cultural stream, then it is true to say, I think, that there has been no comparable national investment of the same scale or the same impact. So, we start from that very favourable benchmark.

The Chairman: We are all anxious to hear the "but".

Senator Cameron: The Council's rapid growth, particularly in the last three years, when spending on social science programs has increased tenfold from \$1.3 million to \$11.3 million, is very significant because it is in this area of our society that there has been the greatest lag. In other words, there has been a tremendous need to catch up with the advances in the technical or natural sciences, and this is another significant step forward.

I think it is fair to say that the members of the Senate committee have been impressed by the fact that in the submissions that have come before it so far relatively little has been said about research programs in the humanities, although I am aware that we will probably get more of this when the universities come before us—at least, we hope so.

Because the Canada Council has become big business, and people are working under pressure, it is natural that from time to time mistakes will be made. Sometimes some of the mistakes may be blown out of perspective and cause a great deal of unfavourable publicity. I am going to refer to only some of these items. As a person who is in contact with a wide cross-section of the public I do know there has been a good deal of questioning of some of the minor decisions—and I want to emphasize the fact that they are minor, but in terms of public relations they do have an effect—and I am only going to mention these in passing.

One that caused a good deal of unfavourable comment, and which raised some eyebrows, was the small grant given to the piano smasher who came from New York to Van-

couver. The question is: How can that sort of thing happen?

The Chairman: It is just a publicity stunt.

Senator Cameron: It may be a publicity stunt on the part of the individual, or on the part of those who sponsored him, but it does reflect unfairly on the Council and the good work it has done.

Then there was the grant to the town fool in Vancouver. I do not know why Vancouver should be the centre of these peculiar aberrations, but it is a fact. This fellow has recently been convicted of some kind of offence, and, again, it has an unfavourable effect.

Then, there is the present controversy, and I think there is some room for discussion here. I believe that a scholarship grant has been made to a certain member of the faculty of McGill, one Gray by name. This man might qualify on the grounds of scholarship or potential scholarship, but it seems to me that in using public funds as a weapon, if you like, for social progress that we must look at more than just the question of a man's scholarship. I realize that a man must not be judged on the basis of his political views or the colour and length of his hair, but this again is a situation where a man takes a stand which, at least according to some judgments is anti-social.

It is sometimes pretty hard to justify this kind of grant. I do not question it on the basis of pure scholarship because you can make a case for it, but the fact that a chap like that can be given an award of this kind raises the question as to what checking is done on these people, and it also brings into question, by implication, the criteria for making such an award. I would like to hear something about that.

This is all by way of preface. Some people believe that the imbalance in the development of our society is caused by the lag between the application of science to the humanities as against the physical sciences. Has the Canada Council a specific policy for future action-oriented projects.

Again, taking some of your own statements in the brief where you say that research can be used as a tool of government, have you a program involving long-range planning and involving specific kinds of social action by governments, by private organizations, or other agencies?

Mr. Martineau: May I answer the first part of your question, Senator, by starting with

Gray. The Gray case, we realize, raised some very serious questions. We realized this so much that the full Council discussed it for about two hours. During that time every member spoke freely and expressed his own views. Everyone was in agreement—those who had judged him at first, and then the Academic Panel. The Academic Committee had been in favour of giving him the grant because of his high scholastic attainments. Then it came to us, and we discussed the very things you mentioned a moment ago. I wish you had been there because you would have seen how seriously we discussed that matter. After two hours I took the vote, one by one, and on division it was granted. But, it was given full consideration by everybody. We realized that this decision would not be popular, but the opinions on his scholastic attainments were such that these prevailed. This was the majority opinion, and it was followed.

So far as the piano smasher is concerned, well, we were just taken in. It was an official who handled the request, and he telephoned three persons whom he knew in Vancouver who all said this man was wonderful, and because of that we gave him \$284 to go there and smash a piano. They covered themselves with blood, and we were as surprised as every other Canadian was.

But, the Gray case involves certain very important questions. Perhaps the majority has made a mistake, but if so it was not for lack of thought. I think only the future will say whether it was right or wrong.

As to our program, perhaps Mr. Boucher can answer your question on that. I could, but I think he can do it better.

Mr. Jean Boucher, Director, Canada Council: As you have seen, perhaps, from our brief, we try to define our role as precisely that of an agency which is responsible for supporting that kind of research which is not the research immediately required in the pursuit of broad government objectives. The research required in the pursuit of the political objectives, or the broad social goals endorsed by the Government has to be staged, planned, financed, and programmed by government and by the government agencies that have distinct missions in these areas.

The Canada Council is a corporation that has been set up to subsidize and support the other kind of research, mostly the kind of research that is freely initiated by scholars

and scientists operating outside the government circle. This does not mean we do not respond more readily to certain types of applications. We are also sensitive to the social significance of the research done, but we must be sensitive first to the scientific significance of the research done. We welcome research that has as well immediate social significance, and a great deal of what we support has this kind of significance. On the other hand, we are not in a position to set practical objectives of social usefulness for the public that turns to us with all kinds of requests.

If you look at the table we have produced on page 46 of the brief, which has now been amended by a list of corrections that has been circulated, where totals are shown, you will see that the weight of support goes in certain directions and that this is very largely the result of the demand. It is certainly not the result of our own intervention. It turns out that the discipline with the largest support is history, followed by English literature, followed in quick succession by the three major social sciences—political science, sociology and economics—but right on their heels comes philosophy.

The only thing we can say about that is that this is what Canadian scholars are doing at the moment. We do not as yet have trends; we have not had these kinds of statistics analyzed over a period of years. It may well be that the year for which we did this computation is unusual; we are not yet in a position to say, so it will be a little while before we really know what is the pattern of initiative on the part of scholars.

The Chairman: I think we talked about this the first time we met, but basically your policy is to wait for applications and make awards on the basis of, as much as possible, scientific merit?

Mr. Boucher: Yes. I would like to add one thing. Senators should perhaps realize that the Canada Council program of support for research in the social sciences and humanities is not 12 years old; it is really only three or four years old. Before that there was not in this country any noticeable program of support, so it is very early in the game at the moment, and we thought that our prime responsibility was to offer a broad spectrum of support to draw out the competent scholars who had not been able up to then to give the measure of their talent, and that for a while the wisest thing for us to do was not to try to

prejudge the direction the research would take. We had to open up shop first.

The Chairman: I think Dean Slater has something to add to this.

Dr. David W. Slater, Member of the Council and Dean of the School of Graduate Studies, Queen's University: Mr. Chairman, I think it is extremely important to put the activities of the Canada Council in relation to the humanities and social sciences into the context of developments in these fields in Canada in the last ten years. I would especially emphasize the early stage of development. I do not think it unfair to say that in the social sciences and humanities in Canada, in the last decade for the first time in our history we have had a chance, for a number of reasons, to accomplish something very significant for our people. The central mission, if you like, is the mission of building up the capacity, the scholarly effort, the educational effort and the number of educated people in these fields.

If you go back ten years in this country, it was a very rare exception to find an advanced program of study and research in the humanities and social sciences in Canada. We were living off the rest of the world. A conjuncture of forces and events has given us a new opportunity. The most important element in that new opportunity is our own demography. We have at this stage the most rapidly growing young adult population, which is well educated up to a certain level and is seeking opportunities. We therefore have the greatest opportunity of any developed country in the world to now serve a young adult population. This has meant that the scale of activities in our universities and colleges is of a completely different order than it used to be. This very fact of a new scale has posed very great difficulties for us, not least of which is that we have as a society to invest enormous amounts in research, now and in the next decade, and invest them, as it were, in ourselves, in our young people and in the people who are working in educating them, with the pay-offs coming—when? Not tomorrow but five years from now, ten years from now, 20 years from now. That is the kind of investment process we are engaged in.

The fundamental point of it all is that the scale of our activity, while posing enormous burdens, allows us to aspire to a high quality and a broad range of work the like of which

we never had before. This, of course, has directly generated an enormous need for teachers, for researchers, for performers, for administrators who are knowledgeable and talented, and this in turn has meant an enormous demand on and opportunity for the Canadian universities and colleges.

I think, too, this country cannot live on the backs of the British and the Americans for the advanced training of their people as much in the future as it historically did. What we have done in the last decade is make a beginning, especially in the humanities and social sciences. The humanities and social sciences in this country have come along in a sense at least a decade, maybe two decades, maybe two and a half decades, after a comparable kind of development took place in our natural sciences in this country. What I think this means is that we have an enormous scale of responsibility, an enormous scale of improvement in our opportunities, a tremendous need for highly trained and educated people of all kinds. We cannot and should not live on the rest of the world in anything like the way we did before.

The central mission, if you like, associated with education and higher education, is in fact responding to that challenge. In the social sciences and humanities there have been two or three other things that have given new opportunity. The development of computing for example is an extraordinarily important thing in the social sciences and humanities because what that has meant is that we, for the first time in the history of the state of these subjects, are able to work with masses of data, and analyse masses of data, build really comprehensive and systematic models to inject indeed a very substantial element of science in the social sciences.

It is not only the social sciences it is the humanities too, because the thing that is especially interesting now is that a very strong drive exists in things like non-numeric computing in the humanities. In a subject like English you find the change, if you like the technology part of this new opportunity that we have. I believe therefore that what we have done in Canada by our universities development program and the Canada Council program are not identical, but closely interrelated.

In the humanities and social sciences for the first time we have begun to respond to this opportunity. I believe I could cite case

after case or example after example of indications where the program is producing success. It is producing payoffs and we are drawing into these subjects first class people who are working very hard. I think we are going to be developing a quality of teacher and researcher that is going to serve this country extremely well.

The Chairman: Would you give us a few examples? I have not visited universities for a long time.

Dr. Slater: Yes, I think in my field, which is economics, we are training an extraordinarily well educated and well trained young group of quantitative economists. These people are going to play a major role in the analysis of economic events, in sorting out economic policies and in the development of econometric models and the application of econometric models in government and in business. It is not an accident at all and it is not purely a matter of the Bank of Canada's initiative. It is not an accident that we have an active group of young econometrics and some of the best in the world. We could not say that 10 years ago. We did not have anything like this kind of resource. The business community is wanting these people and the Government is also wanting them. They are playing a role in modelling in quantitative approaches to all kinds of problems. The Canada Council has definitely made a contribution.

I will take another example which is especially exciting. One of the rather unique Canadian opportunities is in the field of non-numeric computing, especially relating to information storage and retrieval. One of the areas which may be surprising to you, but which is of great interest is in law computing. The Canadian opportunity here has gotten some extraordinarily interesting features. Firstly, we have more than one legal system, therefore this is a problem and we have a sort of unique problem of fitting them together. We have the aspect of more than one language that is official. We have this problem because law is something which is precise in its use of language and therefore amenable to experimentation in information storage and retrieval and it presents an extraordinarily attractive opportunity for experimentation in this domain.

The developments in this field are things which have enormous impact in areas other than law computing. In other words, you are

dealing with a particular set of problems, but they have general implications for information storage and retrieval. Out of this we may get a unique development, a lead in information storage and retrieval. Not only is this a matter of importance from a scholastic point of view and a practitioner's point of view, it is very important in relation to Canadian development. We are never going to make a living out of trying to build fourth generation big scale digital computers, but we do have a great opportunity in developing peripheral software systems, et cetera, that are related to this type of non-numeric computing development.

The Canada Council is supporting non-numeric computing. Within a framework of this broad mission there are many opportunities which are being developed through the Canadian Economic Council. As for the Canada Council itself, I think that its problems are problems of self-analysis, such as seeing what it is doing in regard to success and failures. My feeling is that the fundamental point regarding the Council, in the scaling up of this program, has been right for the time, in the most general, important and fundamental mission sense in this country. That is what I think we have got to keep our eye on, not the little mistakes as you yourself acknowledge, Senator Cameron. There is this non-numeric computing, for example, and this development of econometrics.

In this country one of the great disappointments has been the ineffectiveness of geographical analysis, space analysis, location of industry, and all that sort of thing, as well as urban analysis. I worked in this field for a time and I know a little bit about it. The problem, Senator Cameron, was that up until about 15 years ago you could have, on the one extreme, some nice, simple abstract geographical models, and on the other extreme you could have some extraordinary low empirical material. We were simply not able to bridge the gap between the abstract models and the data, because we did not have the data gathering manipulation analysis capacity.

We are getting it now. Geography in this country is just going through a revolutionary development, and the Canada Council is supporting projects which are part of that revolution.

This just perhaps illustrates the point, Mr. Chairman.

Mr. Martineau: May I try to answer directly? So far, the Canada Council has not initiated

ed any research. It believes that the pool of scientists is not such now that it can do that. We are rather working on extending that pool and, when it is ready, the Canada Council should do that at some future date.

Senator Cameron: I appreciate all that has been said, but the point I am getting at is this. I am looking at the expenditures through the Canada Council as a tool of social policy in Canada. I think you have done a good job, I have said that in the beginning, and again, looking to the future, I know you have some arrangements for an interchange of membership between the Economic Council and the Canada Council and the Research Council, and I think this is all to the good.

I am wondering, however, because of the speed with which we are moving in social change, whether we can risk leaving it entirely to the academics. I am speaking as one who has been a member of a joint faculty council all my life and I know the kind of things that come up from time to time in requests for grants—such as in the role of the comma in literature, and things like that. I am wondering whether you are satisfied with the machinery we have today in the Canada Council, looking to the future, the integration of scholars, engineers, businessmen, and so on, in planning and anticipating the future.

Mr. Martineau: This is exactly what we have in the Canada Council. I myself, with all due respect to you, Dr. Salter, would not leave it all to the academics. The Council is not made up only of them. Far from it. It is composed of businessmen and practically every kind—

The Chairman: Even lawyers.

Mr. Martineau: Yes. Even though the academics are well represented on it, they are not a majority on it. I think we have a cross-cut of everything. This is excellent from the point of view of the businessman, the engineer, the lawyer, together with the academics. This is safer than if it were limited to one group. For instance, if the law were given exclusively to the Bar, the Bar would see it from the inside and might miss seeing it from the outside, and that would not be good.

Senator Cameron: This is in no sense criticism. I simply ask, do we need to go a step further in the machinery we have created, in providing a means of involving non-governmental organizations and organizations to a greater extent than we have so far. Certainly

you have lawyers, engineers and businessmen on the Canada Council now, but they do not or may not—they bring the point of view of the industry or profession they represent, that is true, but how far do they go in involving the organizations in their communities in developing action projects for the future. This is what I am wondering. Is there any machinery?

Mr. Boucher: We would have to say that this does not go very far. It does not go much further than the initiatives taken by universities to pursue the same objective that you are raising. I do not know that it would really satisfy you as an answer, but it might be useful for senators to know the kind of questions which come up in actual fact in the management of the Council.

Over recent years, we have had our funds growing at a very substantial pace. The figure you quoted of \$11 million is a figure which is already two years old now. The figure now is \$19.4 million, so it has risen from \$1.3 million to \$19.4 million in something like five years. What has happened is that we have viewed the problem very largely as an operation of recovery, to bridge the gap between the kind of support provided for the social sciences and humanities and the kind of support that has been traditionally provided over decades for the natural sciences.

At the moment, we are spending—and this will surprise people, I do not think it is generally known—we are spending as much money on the social sciences and humanities as the NRC and MRC were spending six years ago. So we are where they were six years ago. But they had been at it for five decades and we have been at it for barely a decade. We are still able to support only a much smaller proportion of our researchers in training, that is, the doctoral students, and of our career researchers, through research grants. We have been working at reaching what we would regard as adequate levels of support.

At the same time, for the past couple of years, we have been asking the Government—and, we will have to admit, at the wrong time—for additional funds to provide development grants, to provide a new type of assistance which would be directed at strengthening certain specific areas of activity. This is not the moment to get this kind of deal from the Government. But the NRC had started this approach just before the austerity period. They have been building, they now

have three or four years of experience in this field. We still have not embarked upon it yet. We have not got the funds to do it. It is not that we are not asking ourselves these questions, but it is that, while our funds have grown tremendously, they have not quite allowed us to earmark special funds for the kind of special programs that you have in mind.

Mr. Martineau: But we have asked for them.

Mr. Boucher: We have asked for them and we are reasonably confident that this is the kind of development the Government would be prepared to support as soon as the financial situation has eased up somewhat.

The Chairman: In other words, would you say that up to now and perhaps for some time in the future, the main function or the main mission of the Canada Council has been to build or try to build a capability for research within the university community?

Mr. Boucher: That is right.

Senator Cameron: I would like to go back to Dean Slater's point. On the radio this morning there was a comment by Dr. Steele of Carleton University, in which he says that 80 per cent of the professors in the social sciences are non-Canadians—he did not say they were Americans.

I know this has been true up until a few years ago, but I was rather shocked if that percentage is accurate today.

Mr. Martineau: It is not. Mr. Milligan can show you.

Mr. Frank A. Milligan, Assistant Director of Canada Council: I think the truth is that at the moment no one has enough statistics to say what the percentage rates have been. There are some things we do know. We know that, with the extremely rapid growth of universities in the last ten years that Dean Slater has talked about, it would simply not have been possible to staff them with Canadians, simply because of the historic situation he described, where we have had a very anemic progress in advanced studies in this country and relatively few Canadians were going abroad to take advanced studies in Britain or the United States or France.

The only way that the universities could respond to the enormous demographic pressure was by hiring outside the country and,

as it happened, there was at the same time a loosening up of the supply in the United States.

I think there is a combination of reasons why American scholars suddenly began to find employment in Canada attractive. There is room here for investigation as to why American scholars were so willing to come here. It may be partly a matter of the political climate. It may be the Viet Nam situation in some cases. It may be partly that for the first time they began to find that salaries and working conditions and research support in this country were becoming competitive with the American universities. There may be a number of factors, but the fact is that they came, and came in large numbers.

As this happened, the incidence of its impact was uneven. In a large established institution like the University of Toronto there was a solid base of established scholars who were largely Canadians and the absorption of the newcomers was not too great a problem. But a new university like Waterloo or Simon Fraser, or a rapidly-growing but relatively young one like Carleton, felt the effect of this uneven factor in the staffing of its faculties, even to the point where in some departments a majority of staff are non-Canadian—and, specifically, American.

This does create problems. It creates the problem of curriculum as these people bring their own academic interests with them. We have complaints that a department of English will offer six courses in the American novel and one course every second year in the Canadian novel. It is a reflection of the character of the particular departments. There is another problem, namely, that the hiring of staff in Canadian universities is very largely in the hands of the departments themselves. As a department becomes solidly or very largely American there is a tendency for it to hire through its own "old boy" network in the States. This is a problem that the universities have to face.

So in some of these institutions there are quite critical problems which they must cope with, but I am still convinced that it is a passing phase. I think part of the reason that it is a passing phase is reflected in the statistics which we are now able to put out about enrolment of Canadians in graduate schools both in Canada and abroad.

There has been an enormous growth of graduate schools, particularly in the humanities and the social sciences in this country.

For example, this year, in our own doctoral competition, for the first time over 50 per cent of those receiving first awards are intending to enter Canadian graduate schools. Three years ago it was less than 25 per cent. This is the kind of growth that is developing.

I would see that within three to five years we will be reaching the point—in fact in some disciplines like English literature and history it may well be before that—where the Canadian supply is fully equal to and perhaps even in excess of the needs of Canadian universities. It will not be in excess of the needs of this country, because I do not think there is any limit to the needs of the country for people with these kinds of qualifications in the humanities and social sciences.

As this happens there will be a readjustment in the balance of Canadian and non-Canadian scholars. Some of the people who have come from other countries will go back; some will Canadianize themselves. In fact, some are doing so now. It is reflected in the applications we get from them, where they indicate that they are shifting their research interests to Canadian matters. They have a learning process to go through and sometimes it is difficult for them, but some of them do it and do it very successfully.

Some of our best scholars in this country now concerned with Canadian problems and Canadian development are people who have come to us from other countries.

As I say, there are very real current problems and I would not want to minimize them, but I think they are only current problems.

Senator Cameron: I would hate to think, Mr. Chairman, that our appointments would be made on a nationalistic basis. I think the criterion should be to get the best man regardless of where he comes from. I appreciate all the points you have made about the fact that we did not have a pool to draw on. We will have it within three to five years. This will make a change. But I think it is not good to have this kind of statement being made, unless the criteria on which it is made are also put forward.

The Chairman: It was without the use of computers.

Senator Cameron: Yes. Now, Dean Slater spoke about the fine work the economists are doing and I think this is correct. I think they have a big job to do yet to get our economy back on the rails. But in mentioning the econ-

omists, is there any significance in the fact that he did not mention the sociologists? Because these are the people who seem to be causing a lot of trouble, particularly in our new or instant universities.

This is an area in which there is a great lack in this country, a lack in the sense that we have done very little in using the sociological tool, but we seem to have been rather unfortunate again in some of our instant universities in the kinds of people who come in from outside, who do not know our conditions and who have been involved in actually promoting student unrest. I am sure this does not come from their scholarship. Have you any comments on that?

The Chairman: Do you mean that we are about to have to import university presidents?

Dr. Slater: Maybe we are going to have to have a new graduate school to produce new university presidents.

Seriously, I think we recognize that there are some problems. They are part of the fabric that Mr. Milligan has put to you, Senator Cameron. They are accentuated in the case of sociology by the newness and the difficulty of the subject itself and by our special backwardness in the development of sociology. So, in addition to every problem that Mr. Milligan pointed to, which are general problems, you have as well in sociology two additional problems. My belief, sir, is that sociologists are tackling very serious and difficult problems. Among the people they are attracting to the subject are some bright people, devoted people, people of very considerable skills, and my expectation is that some of the problems of sociology and some of the other problems we associate with sociology in some of our new universities are in themselves passing phases. But I am an optimist in this respect, sir.

Mr. Boucher: May I add, Mr. Chairman, that it is rather ironical that the one debate that is going on at this precise moment with regard to a divided approach in a department of sociology is happening at the University of Montreal, where the facts are exactly the reverse. There the contention of the young Canadian sociologists is that the imported sociologists are tamer than they are and are not as radical as they are. So it is by no means the general situation that it is the foreign-born sociologist who has been in Canada the source of worry or the source of

social disturbance. It is a fact, however, that this is a discipline which our society has not yet been able to use in a way which would dispel a good deal of the frustrations that its members feel.

Sociologists by definition are critics of society. That is their profession. And our society has not itself found ways of using them in a fashion which would put their talent to best use so that this frustration tends to take some exacerbated character at times. Our society has not found ways of using all our scientific talents. I am not sure that it uses chemists very well, or other people in the natural sciences. Certainly it has not yet found ways of using botanists or astronomers unless they are employed by government. We know that there are disciplines where the eventual use by society of the knowledge acquired is still very much a substantial problem, and we hope with the passing of time to find a solution but this will not be easy.

The Chairman: Could I ask a supplementary question on this. We are not just discussing the Canada Council here; we are discussing a very important problem. Have you made any studies about the way we are preparing sociologists in Canada, and not only in Canada but throughout the world because it seems to me that this is a world situation. I would think that it is quite difficult at the moment for a sociologist to interpret our society or to try to arrive at laws which describe the functioning of society without any kind of knowledge of economics and the infrastructure or the workings of the infrastructure of a society. The result is that not having good enough principles to interpret the behaviour of our society they tend to become more action-oriented because of the weakness of their scientific base.

Dr. Slater: I think there is something in that, although sociology is very much a mixed bag. I spoke earlier about having time to study urban problems. A decade ago much the best urban demographic work was being done by sociology. It was much the best by any test. If you take another example, it is not at all accidental that some of the strength of the Yale law school nowadays is because of its strength in criminology and the sociological relationships which exist and which people have studied very carefully using all sorts of methods. To take another example, and this of course is going to be one of the most fundamental things that will be the salvation of sociology, we find that it is being

infused very much by quantitative methods and computer technology to the point that instead of running three spurious correlations in three hours you can now with a computer run 3,000 and you can run them on the most grandiose scale. Of course there may be people who want to correlate everything with everything else and thus arrive at sociological laws. In these cases without the use of scientific standards they will probably get clobbered.

The Chairman: Going back to the machine, that may be one way to opt out of our society.

Dr. Slater: I would not think so. The standards of evidence abstraction and confronting the ideas with evidence and trying to establish truths that are something more than spurious correlations—those forces will take hold and I think they will build very strongly, if you like, and they are going to purify sociology and I believe that is going to be a major force in the development of what we might call the scientific core of the discipline. I do not believe, Mr. Chairman, that action can be undertaken sensibly or effectively from a long-term point of view without a solid base of knowledge in which you have confidence, so that you can persuade the community that you know what you are talking about, that you have a base of evidence and thought and that it is not a superficial sort of approach. I do not believe therefore that sociology will be effective in action unless it has this solid core based on scientific and scholarly work to meet the very best standards. Again you can see I am an optimist in these things and I think there is some basis for optimism.

Senator Cameron: The pertinence of this discussion to this whole area may be that in awarding grants some more careful scrutiny, if I may put it that way although it is probably not the best way to put it, might be given, although I am sure this is already being done, to see what kind of people and what kind of projects are being supported. Perhaps the best way of putting it is to suggest that this might be given even closer scrutiny. However, I am going to ask one more question and then pass the questioning on to my colleagues.

Mr. Martineau: Before you do that, Senator Cameron, may I say that it is being given much more scrutiny than one might think—even from mere lawyers. We look at the project and say "should this not have it rather than that?" and "would this not be more

important for the country than that?". Probably we could do more of this.

Senator Cameron: I have one more question. On page 13 you discuss a problem which is of real concern to this committee and that is the question as to whether or not there should be a minister of science. I notice you say:

On the other hand, with the growing acceptance of interdisciplinary approaches and the growing need for common services, a good case could be made, although it has not been made yet, for a single Minister (not called a Minister of Science either) having responsibility for all programmes of aid in support of university research, including the national information services of the National Library and the Dominion Bureau of Statistics.

Have you anything further to say on that particular problem because it is something that this committee has to face.

Senator Grosart: May I add a supplementary, Mr. Chairman? Would you include the Canada Council under that Minister?

The Chairman: Of course.

Mr. Boucher: I would not say that this is a suggestion because it is simply an idea thrown into the arena for discussion and it stems, of course, not from the general concern that has inspired people to suggest that there should perhaps be a minister of science. What we are saying at the moment is that the various governmental programs that are all directed in one way or another to support research development outside the government, in the universities mostly and in other private institutes or among consultant firms and similar bodies, have to come closer and closer together. Basically, they have to come closer and closer together for two reasons. The first is because more and more research cannot be nicely fitted into either the natural sciences or the social sciences or the humanities. More and more projects are interdisciplinary, and more and more should be interdisciplinary; and this trend must be encouraged by all means. No big issue or problem can be tackled unless persons with a great many different skills are brought together to tackle it. So, this is one reason why, at the moment, we find ourselves in constant consultation with NRC and other agencies—"What can you do with this?" We might be prepared to do

that much", "Will you pick this up, or shall we?" There are a number of disciplines which are frontier disciplines—psychology, geography, archeology, anthropology. All are partly accepted as the responsibility of NRC, and partly by us, so these problems are more and more common and their importance will grow

The second problem is the development of common services. There is a report that has just recently come out, last week, the Tyas Report, on the establishment of a scientific information system. This report does not exclude the possibility that social research would be included under the system, but it is quite obvious that the report was not intended primarily to serve that purpose, and that a system like the one proposed might well not include the social sciences. It is obvious that if we were to make any such mistake we would very soon regret it, and bitterly.

This is why the very difficult problem that we have now—which we think may well be the major national problem in research, namely the development of national information services—is one which must almost from the outset include all the research, and it must be set up, perhaps not as suggested by the Tyas Report, primarily to serve the small manufacturer or the vast majority of manufacturers, but to serve the scientists, the engineers and the people who can read the information. These people are very largely the professional researchers. They could be in the employ of government; they could be in the employ of businesses; and a great many of them are in the employ of universities. So, if we are going to have any such system, it must be beamed at a very broad public.

This kind of thing could very well be under a minister who would see his responsibility as the support of research throughout the nation, of work done mostly by scientists, not necessarily limited to its industrial use and not limited either to its governmental use.

Senator Aird: A supplementary question, Mr. Chairman, was the Tyas Report a one-man report?

The Chairman: No.

Senator Aird: Was there a social science input into the report?

Mr. Boucher: It may be somewhat difficult for us to comment on the Tyas Report too much, but it is a fact it was written by a public servant, originally at the request of a minister. It is a report of a special nature; it

is not of the same kind as other studies. Included in the team of consultants were people coming from various fields, but mostly information experts.

Senator Grosart: I did not get an answer to my question, Mr. Chairman.

The Chairman: We have embarked on a broad but important subject.

Senator Yuzyk: Perhaps it could come up after my question.

Senator Grosart: But, Mr. Chairman—

The Chairman: Just a moment, please. I want to explain the procedure. Mr. Boucher has commented on a Minister of Science, and I understand that Mr. Milligan and Dean Slater would like to add comments; but I am in the hands of the committee.

Senator Grosart: I would very much like an answer. In fact, I would like to see more answers here and less lectures on the questions asked.

The question is a simple one: In the suggestion that a good case can be made out for a single minister whose responsibility in a certain area would include the National Library and the Dominion Bureau of Statistics, would the Council include the Canada Council under that minister?

The Chairman: I thought you received an answer to this.

Senator Cameron: Yes, he said, "Yes."

Senator Grosart: If he did, I am sorry, because I did not hear the answer.

Mr. Boucher: I am sorry senator, but it was quite clear in our minds. If you refer to the last sentence of that paragraph you will see that the minister we thought was as close as could be to that minister at the moment was the one already responsible for the Canada Council and the National Library.

Mr. Martineau: And the answer is, "Yes," senator.

Senator Grosart: That is all I wanted to know.

Senator Yuzyk: My question is along the same lines. On page 15 of the brief reference is made to a parallel Social Science Council of Canada, after mentioning the mandate of the Science Council of Canada.

Is the Canada Council prepared to recommend the establishment of a Social Science Council of Canada as a parallel step, shall we say, to a Minister of Science?

Mr. Boucher: I do not know whether I can speak for the whole Council on this, but I would say that the Council is probably not prepared to recommend this at the moment, because the Council does not yet know how the Science Council will perform for the natural sciences.

Senator Yuzyk: We have some evidence now, because this has come up before our committee, on the work of the Science Council of Canada.

Mr. Martineau: We have no kingdom to defend, take my word. We are doing our best, and I think we have done pretty well so far with what we have had. If someone shows us that we could have done better than we have and that somebody else could do better with the same, then we have no objection; but before saying, "Yes," we have to be shown that we are not doing the job and that somebody else could do the job better with the same kind of money. Otherwise we say that everything is set up, we are doing it, and why duplicate?

Senator Yuzyk: In other words, you consider the Canada Council actually is doing the work of a proposed Social Science Council? I say that, because it has been proposed, on the part of some people, that a Social Science Council be formed.

The Chairman: I do not think the Canada Council would pretend that, because it has no responsibility to advise the Government on policy.

Senator Yuzyk: That is why I am asking the question here.

Mr. Martineau: Not on that. We do not do that, but so far as helping the social sciences to develop is concerned, I think everybody has been satisfied so far. If anyone else can do it better, then, all right, take it away from us, but until then...

Senator Yuzyk: At page 16 mention is made of a national social science institute. I would gather this is a more definite recommendation than the mention of a social science council.

Mr. Boucher: I would say that this is a reference to a proposal that has been bandied around, and one that has been mentioned by the chairman of this committee at times...

The Chairman: Am I on trial now?

Mr. Boucher: This is a comment by the Council on what the Council thought was a proposal on which this comment might be welcome. The comment that we are making on this is that it would be a useful development especially if it pursued certain objectives rather than others, if it were primarily intended to provide a free opportunity for social scientists to spend some time away from teaching duties. If an institute like that were primarily established as is perhaps being suggested at the moment—and I do not think this was the original view of the chairman of this committee—as a sort of permanent substitute for royal commissions, or as a much more efficient research entity to do the research in the social sciences now being done within departments, the in-house research, then we are not quite sure that this would be the answer. First of all, we think that if the social sciences research done in government departments is deficient at the moment, then the problem would not be resolved by creating a single institute with a universal responsibility before the Government has tried to secure improvement in the performance of the existing research divisions of departments, quite possibly by changing the expectations placed upon them.

Senator Zuzyk: There is the National Research Council, and this would appear to be a sort of a parallel in the social sciences.

Mr. Boucher: Yes. I think that in that sense...

The Chairman: I think I should try to clarify this situation. I understand that there are more or less three possible functions to be envisaged. First, the providing of assistance to the social sciences by an agency supported directly or indirectly by the Government, and supporting research in universities and, possibly, in industry. Secondly, as Dr. Solandt has proposed, there should be perhaps a parallel council to the Science Council to advise the Government on science policy with respect to the social sciences, but this will be a very restricted function parallel to that of the Science Council.

Then there is the third thing which has been proposed by a few, the creation of a kind of research council within the Government which would conduct actual research itself. So, there are really three things which are quite different.

Senator Zuzyk: Yes, but we still have parallel developments in these two broad fields: the social sciences and the natural sciences. I am just wondering whether the Canada Council has been giving thought to this progression, shall we say, towards a ministry.

The Chairman: I understand from the brief that the Canada Council is satisfied with the status quo.

Senator Zuzyk: I have just one more question, Mr. Chairman. On page 22 of the brief you say:

Means are now being developed or involving academic advisers more closely in assessing the results of Council-supported activity.

And then further down the page you say:

The Council expects to undertake pilot projects of this kind during the current year.

Now, has such a pilot project been commenced at this stage?

The Chairman: I understand that Mr. Milligan is prepared to answer that question.

Mr. Milligan: Our problem in this area of evaluation is that the Council as an administrative organization is no better equipped to evaluate the results of its support than it is to evaluate the proposals that are made to it. We do not pretend to be specialists in economics in history, or in English. Certainly, we cannot rival the expertise of the people who are applying to us and the people who are holding our grants. If there is to be evaluation it can only be done by enlisting the support and assistance of people who have that particular type of expertise.

In the past three or four years, as the program has developed, we have almost by accident of faith been simply doing the best possible job we could in assessing proposals, and making the grants where the assessment supported the proposals and then, in effect, by an accident of faith, assuming that the results would be worthwhile—not that there will always be success because failure is an inescapable part of any research activity. But now we do have to look at results, and I think we have to look at them at a number of different levels.

There is the analysis of the general direction and balance of the work that is being done with our support, and this is largely a statistical or global analysis type of thing. We have to draw on our records and again enlist

the aid of the scholars, to get the economists, for example, drawn into the process.

Senator Yuzyk: Would you get the D.B.S. involved also?

Mr. Milligan: The D.B.S. at the moment do not have any means of assembling this information, but if we can get the Canadian Economic Association. .

The Chairman: But they are looking at this.

Mr. Milligan: Yes. If we can enlist the Canadian Economic Association to look at the pattern of our grants to economists and analyze what has been done in the context of the total amount of activity by Canadian economists, they can see what impact we are making, and what sort of balance of activity there is among their own people, the economists of the country. They are in the best position to suggest where there are weaknesses and where special efforts need to be made to improve the balance of activity. This is one type of analysis that has to be done.

We did this on a very modest scale a year ago when we gave to the various learned societies lists of all the work we had supported, and asked for their comments and evaluations of it. In the future we will do this more systematically.

The other thing we must do is look at the individual projects we are supporting. Here again we will have to vary our methods according to circumstances, but in every case we shall have to enlist the help of the academics themselves.

For very large projects which we are supporting over periods of three or four years to the tune of \$40,000 to \$60,000 a year, it is clearly justifiable for us to assemble a small team which will go out to see what is being done and what is being accomplished. This is not to police the work, because the kind of people we would put on that team would be the kind of people who could make suggestions for the improvement of the work.

Senator Yuzyk: Do I understand that you have such teams at work this year?

Mr. Milligan: We will this year initiate the use of such teams on our projects. For smaller projects we will have to do it on a smaller scale, otherwise the cost of the evaluation will outrun the cost of the project itself.

This is the type of work that is being developed at the moment.

Senator Grosart: On that subject, what is the present procedure in respect of accounting by individual recipients for the expenditures of the money you grant?

Mr. Milligan: We require financial statements. Where the grants involve any use of university facilities, which a large grant includes, they are administered through the university and we get reports from the university. A considerable number of scholars have grants for travel to, for example, the British Museum or the Bibliothèque Nationale in Paris for a summer's work, and these smaller grants are made directly to the scholars, who must account on their own behalf. At the same time, we get reports on what has been achieved with the grants.

Senator Grosart: From whom?

Mr. Milligan: From the scholars. There is no way, except at prohibitive cost, of policing it. There must be an assumption that these scholars are honest and conscientious people. We get indications from time to time from some academics that a colleague has been abusing his grant. That is very rare. I think it fair to say that there is no way of having a cast-iron guarantee that the money will be used precisely for the purpose for which it was given. Normally it will result in some evidence of the work having been done, in the form of a publication or something of that sort.

Senator Grosart: We are dealing here with public funds, and accountability has always been an essential principle in the spending of public funds. I ask this question because within the last three days two grantees of the Canada Council have been interviewed on the radio. The answer of the first when asked "Where are you going?" was, "I am not sure, but I think I'll go to Moscow", which was understandable, because it was a ballet dancer. Asked where she was going from there she said she did not know. When asked what course of study she was undertaking her reply was, "I am not sure I am going to undertake any. I want to see Europe." I have discussed this matter with other grantees and I get the impression that by and large there has not been in the past a pre- and post-audit of expenditure of these funds. If this were the Rockefeller Foundation the grantee might be told, "I think we would like to see you go to Europe." Here we are dealing with public funds. I would emphasize that we are dealing with people of normally not high income, and

I get the impression that the Canada Council seems to forget this at times.

Mr. Martineau: We have often had discussions on this and are very conscious of that problem. We have tried to find means of doing what you suggest. As a matter of fact, I have often proposed that spot checks be made, but that would be costly. Before granting this money we always get the best references, and only in the exceptional case is it abused. Even spot checks might not show it. We would have to make a check more than once during a year and it might be too costly. If you could find a way in which we could do it we would be very happy to hear of it.

Senator Grosart: Everybody spending public funds has eventually to find a way. This is an essential requirement; it is part of the trust and responsibility of anybody who has the granting of public funds.

The Chairman: I think two of our other guests wish to add to this.

Senator Grosart: I should like to define my question, because I am not particularly concerned with the system of policing or checking. I am relating my question to pre-audit and post-audit. In other words, how specific are the requirements so that the intention of the prospective grantee are laid down before the Council; and is there an audit, even from the reports of that person? I am not suggesting having police running around.

Mr. Martineau: You are speaking of individuals?

Senator Grosart: Yes.

Mr. Martineau: With bigger grants we do check. We have considerable checks for the big ones.

Senator Grosart: I can understand that. I think it is well known that I have been in the public relations business all my life, and, if I may say so, some of your worst enemies are your grantees, who understandably exaggerate. I see a good many of them in my office and have heard them say, "I have got a Canada Council grant. I am going to Europe. I am going to have a hell of a good time." I have asked, "Is it that easy?" and they say it is.

Mr. Boucher: I think there are a certain number of things to say on this. First of all, a distinction must be made at least between support given to artists and support given to

scholars. I do not know whether the senator has in mind artists who have been sent abroad under the arts program of the Canada Council, or whether he has in mind scholars who have been sent abroad under Canada Council research grants. If they are artists, it is all a question of knowing whether they are going into a structured program or not. If you send a young writer abroad you do not send him to be registered in a definite program. He is going to live abroad and see the world, and this is very largely what the money is for; he is going to meet other writers. If he is a young musician he may well go into a structured program; he may well go to a conservatory, and so we will know whether he is registered in the conservatory. The same will apply with a young dancer.

I assume the object of the discussion here this morning is scholars. Here a distinction has to be made between the support of doctoral students and the support of researchers. Doctoral fellowships are not paid until we have evidence that there has been registration in an institution. When the award is made it may well be that the student has not yet completed his arrangements with an institution, but he will not get the money until this has been done. With research grants for Canadian scholars the system is very complex. Inasmuch as there would be expenditures in the nature of payments for services of others, such as the hiring of student assistants, the hiring of secretaries, the purchase of equipment or anything like that, the payments are all made through the administration of the university. We get periodical reports, and instalment payments are made only when the money is required. In that case we have evidence from the university that indeed student X and student Y were hired on such a date and have been working for so many months; that this or that equipment has been purchased or rented, or that the team is off to the Northwest Territories. This is all verified by the universities. We do not make a double check of university accounting. We will grant that we take this as being satisfactory evidence that the money is indeed well spent. This leaves out the possibility that when there are no such expenditures involved the only expenditures are the personal expenditures of the individual.

The scholar may want to spend two months at Harvard in the law library. He wants to have the travel money and some per diem while he is there. He will be given a cheque payable to him of a certain amount. If it is

small it probably will be in a single payment and will not be by instalment. If he goes for two months, we put the money in his hands when he is about to leave. We get a report from him when this is over. Every scholar is required to make a report and say what he has done. Of course there may be people who lie to us, but this can only be a small segment of our public. It is difficult for a scholar to keep coming back to us claiming to have done what we gave him money for if indeed he did not do it.

Mr. Milligan: I think there is one other part of Senator Grosart's question and that is the question of pre-audit. Every application for a research grant must carry with it an itemized budget and that budget is scrutinized. The people to whom it is sent for assessment are asked to comment on whether it is reasonable or not. These are people who have experience in field research and know what sort of costs are involved. It is also subject to certain limitations the Council, itself, imposes on its grants. The limitation is to the extent of the per diem allowed for subsistence as well as to the type of travel that may be used. They can only get an economy air fare for example. We would not pay them a first class steamship ticket or something of that sort. There is this type of budgetary control imposed from the moment the application comes to us.

Senator Grosart: Is there a post-audit of the pre-audit?

Mr. Milligan: There is a post-audit in the sense that the department of the treasurer of the council checks the expenditures which the applicant must submit on completion of his work against the budget which was approved in the first place.

Senator Grosart: Is there a further general audit of the validity of grants?

Mr. Milligan: I am not quite sure that I understand what you mean.

Senator Grosart: I will phrase it another way. The bank lends me money and they wish to know, first of all, what I am going to do with the money. Before I receive any more money they are going to want me to show them that I did what I anticipated I would do with that money. Now, the bank takes this over all its lending activities. This is all right. We are not going to lend this group any more money, however, we will lend this group, et cetera. Do you do this?

The Chairman: You are really now going a little bit further than the mere financial audit. You want also to ask whether there is a kind of qualitative post-audit.

Senator Grosart: My text, Mr. Chairman, is what I consider the best statement in the whole brief and, not strangely, it is the shortest, page 6 at the beginning of paragraph 11, "A science policy requires criteria."

Mr. Milligan: The criteria are the same as are required in the judgment of an application. It is scholarly merit and the competence of the man to do it. When we have a continuing project and successive requests for grants one of the things that is done is to get a report on what has been accomplished and this material, along with the application, is submitted or it may be, in many cases, resubmitted to assessors. The renewal is not automatic. There must be an assurance to the council from our assessment procedure that in the actual performance to date the original judgment still stands that the project was worthwhile and the man that was supported was competent.

Senator Grosart: Thank you very much. I must say that I am very satisfied with the answers given.

Dr. Slater: There are two or three points to be added which may satisfy my old friend, Senator Grosart, a little more. Research applications have to bear the signature of a responsible university officer. I am going to answer your questions from the point of view of a person who has the responsibility for signing the research application for the university such as NRC, Canada Council or any of them. They have to have a signature of a responsible officer of the university. This is very important. Secondly, the budget that is put into the Canada Council is a full disclosure budget, not just about the grant. It is the whole project and the various elements of financing that would be entered, including the Canada Council. The Canada Council, because of its full disclosure approach, gets the whole picture. Thirdly, in most universities the detailed accounting budget that is set up in the university administration indeed has to correspond to the budget. In most universities there is a research accounting operation that is carried out. If a person wishes to make any major change in his budget he must go to the Council and seek approval. A certain amount of changes may be made with consent, but the grantee on a large grant is not in a position to be a free wheeler and just simply

moving his money around. I think these things are very important and I think in signing research applications on behalf of a university and in assessing research applications, as a reviewer and looking at them and as a member of an academic panel, you are very conscious of the question as to how this fellow performs in this or that thing. That is one of the questions that comes up over and over again. It is a very general point of view in these things.

Give a man a little bit of money and take a chance. For the new man the small thing and so on, but let him show his wares and let him earn his way and only earn his way into larger grants. I think there is a hard-nosed approach to this thing inside universities and outside the universities that I believe you would find impressive, sir.

Senator Grosart: I was sold before, Dave, and not in danger of being oversold.

The Chairman: I am beginning to be afraid of bureaucracy—Too many questions...

Senator Grosart: If I could follow with one question coming out of that. The term free research is used quite frequently throughout the brief. Would somebody define free research as contrasted with unfree research?

Mr. Boucher: The term is short for "freely initiated research". That is what it means as against contract or commission.

Senator Aird: I would like to refer back to Dr. Slater's remark about freewheeling and to the appendices on page 40 and page 41. I noted with interest the different procedure that is involved inasmuch as the ultimate decision-making authority, is concerned as I understand it. On Appendix C, chart 1 lists the Canada Council, as contrasted to Appendix C chart 2, where the ultimate decision-making process lies with an academic panel of 18 members. It seems to me, on the remark made by Dr. Slater as to the content of approval, and perhaps not so much on the accounting side, that it is anomalous, that this division is contrary to the concept of it.

What I would like to ask, Mr. Chairman and Dr. Slater, is why there is this difference in handling applicants? It seems to me that the ultimate decision-making authority might very well lie the other way around. As a lawyer, Mr. Martineau, this is perhaps a mechanical question and it is one of policy, but it seems to me that when we are dealing with funds of this nature and when we are

dealing with important grants, the decision-making process might very well lie with the Canada Council on the more important ones.

Mr. Martineau: But it does, senator.

Dr. Slater: I might reconcile this more quickly, because I have been a member of every one of those levels. The Council has the final authority on everything and takes final responsibility on everything. With respect to the adjudication process, the Council sets and agrees to the terms of reference of the doctoral fellowship program, the general criteria, etc, and takes responsibility for that. It does not as a council make a decision and a review of three thousand individual applications. It does not adjudicate three thousand individual applications as a council. The adjudication process itself, the terms of reference and composition, in the first place, are those things determined by the Council, and within that framework there is an adjudication, to select the particular candidates within those terms of reference. Thus, the terminal element is the Academic Panel.

Mr. Martineau: To make sure that there is no misunderstanding, may I say I have taken that long list, and there are thousands on it, and I have gone over it. I have put dozens and scores of questions as to why we had this project and why not that project, and so on. It is after this discussion that the list is approved generally. For the big grants, we go into it even more thoroughly.

Mr. Milligan: Every research grant over \$10,000 automatically goes to the Council for a decision. Every grant between \$5,000 and \$10,000 may be awarded by the Academic Panel. If there are any doubts in policy issues, the panel can refer this to the Council; or the officers can propose to the Panel that it be referred to the Council.

Senator Aird: Then with respect I would suggest that you might amend the wording on Appendix C, Chart 2, because this says that these decisions are reported to the Council.

Mr. Boucher: This is correct, because this is the program of doctoral fellowships.

Dr. Slater: What is needed is, I think, a statement that the Council sets the regulations and the Council tests the credibility of the performance.

Senator Aird: Yes.

Mr. Martineau: That is what we do.

Mr. Boucher: The answer really is that physically the Council, meeting as it does for the length of time it meets and at the frequency it meets, cannot clear all the thousands of awards that are made. So there is a system of delegated authority in the Council up to certain levels, of expenditure which are away below the levels of delegated authority in any Government department and in the Treasury Board. The review by the full Council is a great deal more demanding than prevails in any public agency in Ottawa.

Mr. Martineau: We would like to make the senator certain that I for one, and all the others, do look at this list, even if they have been granted, and we discuss them to see if the decision was good or not good. They come eventually before us. I am talking now only of the smaller ones.

Senator Aird: I thank you for the clarification and I would ask a question of which perhaps I should give notice, because I think it makes your case and your explanation or clarification much more precise. What percentage of applications do you turn down—in page 40, Appendix C, Chart 1, under the heading "Canada Council makes final decision". You might need notice of that, but you have told me that you look at thousands. I would be interested in knowing what is the percentage turned down.

Mr. Milligan: Mr. Chairman, what goes to the Council in the first place is the actual submission for a grant involving over \$10,000 or over \$10,000 in any one year. In this case, there is no decision until the Council has considered the submission.

In the second place, they get a report on actual grants under \$10,000 which have been approved, which have been awarded by the Academic Panel—or by the officers, if they are under \$5,000. They may question these but in fact the award has been made. They do ask questions about individual instances, about individual grants that have been made.

As has been said, there are always in the lists a certain number of awards that do raise questions in the minds of individual members of the Council and there is an opportunity to discuss them.

In addition, what goes to the Council is all proposals for rejection of applications. There is no rejection but by the Council—except in a competition like the fellowship competition where the making of an award involves

automatically the rejection of other applications. If we have 3,600 doctoral fellowship applications and if the academic panel approves 2,200 the other 1,400 are rejected by implication. In the case of a research grant, where there is no competition, that rejection is made only by Council.

To complete the answer, the failure rate varies among programs. In the competitions, there is provided, at the outset, a total amount of money or a total number of awards to be made. The failure rate will depend on the ratio of these to what turns out to be the actual number of applications received. In the case of the doctoral fellowship competition, the success rate this year was about 43 per cent so the failure rate was 57 per cent. In the leave fellowship competition, the success rate this year was 60 per cent, so the failure rate was about 40 per cent. These are in a competition. This does not necessarily mean that everybody who fails is lacking in merit; it is simply that there are only so many awards and this is the way they are distributed.

Each research grant application is looked at on its own merits. If it is found to have merit, an award is made. It is an open-ended program. The failure rate on this program is running at about 20 per cent. It is higher than that for the large grants. There is relatively a low failure rate for the small grants. I have not the precise figures, but I would expect the success rate to be between 85 and 90 per cent. For large grants it is between 70 and 75 per cent.

Senator Yuzyk: What do you mean by large grants?

Mr. Milligan: Over \$10,000.

Senator Aird: Mr. Chairman, I think the ultimate decision-making process is important, and, in my mind, it lies with the Canada Council itself, regardless of all these input factors and how it gets there. Could you give me a percentage of the acceptance and failures at that level, the top level?

Mr. Boucher: You are really asking how many applications reach the Council with a recommendation with which the Council disagrees.

Senator Aird: Yes, sir.

Mr. Boucher: The answer to that is really very few, but the system is extremely demanding. When an application reaches the

Council it has gone through a much more elaborate system of checks and double checks than any other program run by a public agency in Ottawa. We do not want to make invidious comparisons, but our system is a great deal more demanding than that of any other agency. There are much fewer applications in any program which reach Council with a recommendation than in any other agency. Therefore, the Council generally agrees with the recommendations, but all the negative recommendations are presented to the Council and the decision is made by the Council. All the decisions on recommendations not to make awards are made by the Council, and the Council is kept aware of all the work done under delegated authority.

I am not sure that that is an entirely reassuring statement.

Mr. Martineau: Let me explain. This is where we start. The demand is made in one discipline; it is sent to from two to eight judges, experts in that particular discipline, and then they make the report. Their report and the requests then are sent to the Academic Panel composed of 15 men of the highest calibre. After that it goes through our own Academic Committee. Therefore, before it comes to the Council, it has gone through these three stages at the hands of experts, but, in spite of that, we do object and even those which have been recommended for rejection are submitted to us in case we should say that they should be granted. There are some very serious discussions on some applications which could have been refused which we think should be granted.

I admit that it is seldom that the Council as a whole will agree. Some are more critical than others, and, being a lawyer, I am usually quite critical, but the discussion takes place and no doubt the officers and the others all remember all these things and take them into consideration for the next batch of demands.

I am satisfied, as Chairman, that everything has been done to get the best. All we regret is that we are unable to give more to deserving ones because we have not got the money. But I have doubted some small ones; yes, I have, but they were the small ones. The others—no.

Dr. Slater: May I supplement Chairman Martineau's remarks by two small points: First, there are two members of the Council who are members of the Academic Panel. They play a role as a bridge and as trustees

of the Council. Those two members are members of the Academic Committee which is a subsection of the Council itself. The Academic Committee, in other words, the subsection of the Council, does screen so that the Council has an involvement. It is not just at a plenary meeting, but Council has an involvement directly in the Academic Panel, and it is the Academic Committee. There are screenings and there are demands that are recommended for rejection at both of those levels, and the Council people, from my experience, and I happen to be one of the two at the moment, are mindful of this and participate in this process of screening and there is real action at that point.

Senator Yuzyk: Who selects these experts, these adjudicators? Does the Council select them before it goes to the academic committee?

Mr. Martineau: We do.

Mr. Milligan: I should clarify that. This is in the research grants program. We work under two different systems. In the research grants program each application is dealt with on its own merits and on the basis of its own substance so that it is analysed by the officers when it comes in and we then find the best qualified people to look at that particular application. The applicant himself is asked to suggest two people who are familiar with his work or whom he regards as being experts in this particular subject matter. It is not just a matter of being a sociologist. It must be someone who has worked and established a reputation for himself in that particular branch of sociology, in that particular area of inquiry.

The fact of the matter is that we are using somewhere between two and three times as many assessors as the number of applications we receive. These are drawn from all over the world, they are not committees of Canadian scholars. Half of our assessors are abroad. They are top American, British, French, German, Italian scholars. We are applying, in effect, international standards of scholarship to every research grant application we get.

The number of assessors we use will depend on the size and complexity of the request. There is no point in using a sledge hammer to crack a very small nut, but for major applications we get we may go as high as eight or nine assessors, or even more, if necessary. There is no limit imposed.

Senator Yuzyk: Is there a time limit for submitting these adjudications?

Mr. Milligan: No, it is an open-ended program and we will accept them at any time during the year.

Senator Yuzyk: But is there any time limit for submitting the assessment?

Mr. Milligan: We cannot enforce a time limit. We ask them for a report within normally a matter of two weeks. I might say, too, that we are one of the few grant-giving agencies in the world that pay for assessments. We do so because we ask these people to provide us with a service. Perhaps this has some effect in getting a quicker and perhaps more judicious response, one that is more carefully considered.

In the competitions the system is different, because here applications are accepted in batches with deadlines and they are weighed against one another. Some here we have to work in committees. In this instance the adjudication is on a somewhat broader basis. In the doctoral fellowship competition, for example, we will have a committee that is dealing with sociology and it will be composed of five Canadian sociologists who will look at all applications in sociology and rank them against one another and then give us a recommendation as to which ones should succeed.

Senator Robichaud: Mr. Chairman, first I would like to know if there is a public list available of the individual recipients of awards or grants.

Mr. Boucher: They are all listed in the annual reports from year to year.

Senator Robichaud: Individually?

Mr. Boucher: They are not listed in any interim publication but, each year, all of them appear in the annual report with the amounts granted and the disciplines involved.

Senator Robichaud: Mr. Chairman, much has been said about the criteria used by the Council to come to a decision in making rewards or grants to individuals, and reference has been made to what might be considered an extreme case, the case of Stanley Gray. Unfortunately, I think we have many reasons to believe that this is not a one-of-a-kind case. I may say in passing that it is definitely having an adverse effect on the reputation of the Council, particularly among students.

Personally I have had occasion to listen to students discussing the different awards, and there is certainly a lot of misconceptions about the activities of the Council. Reference has been made to the criteria involved. It is true that a student or an applicant could be one of the leaders of his class and an extremely bright student. However, at the same time the same individual could be one of the main instigators of trouble, sit-down strikes or demonstrations such as we are having at some universities; he could also be publicly known to be distributing pamphlets at the university advocating disrespect for lawful authority. But at the same time apparently he could qualify for a Canada Council grant.

I listened a few weeks ago to a group of students discussing an individual case which happened in Ottawa and those students were talking amongst themselves about what they should do next year—whether they should do something sensational to attract attention so that they could then apply for a grant. Now I would like to find out more about the criteria and what steps are taken and what efforts are being made by the Council to get more information about individual applicants for awards or grants.

Mr. Boucher: Well, senator, I don't know what I could add to what Mr. Martineau said earlier. Perhaps there may be a few points I could make.

The Canada Council of course has not created the situation. That is the first thing that must be considered. These people before ever getting a Canada Council grant or award are being allowed to register at Canadian universities and before that in many cases they get provincial scholarships, so you see that the Canada Council is not the only institution in Canada which enters into the picture.

Secondly, the Canada Council up to now has not been faced with a situation where it has had to look into other criteria than scholarly criteria. On scholarly grounds there was never any doubt in anyone's mind that Mr. Gray was fully qualified. Then came the recent events which were widely broadcast and which became public knowledge. Knowledge of them had not been gathered through any special investigation on the part of the Canada Council; these events were in the public domain and of course the Canada Council could not ignore them. We realized they could raise questions as to the scholarly merit of Mr. Gray. The Council looked into

that situation and we asked ourselves if these activities were of such intensity and frequency that they interfered with the performance of his scholarly duties. A somewhat similar situation would be if Red Kelly were to ask us for a doctoral fellowship and we in turn asked him "Do you intend to do doctoral work or do you intend to play hockey?" Also, there was the question of the nature of Mr. Gray's activities, whether his activities were of such a nature that the Council felt that they reflected on his scholarly objectivity or competence. The Council voted on that and the Council also voted on the question of certain criteria which might not be related to scholarship but which would be related to character and civic behaviour. The Council considered whether these criteria, or more precisely the evidence which the Council had borrowed from the public domain, were such as to lead the Council to conclude that the award should be withheld. As I say, the Council voted on all these things. It is impossible for anyone on the Council or anyone who observed the procedures to say why Mr. X voted yes or why Mrs. Z voted no. This was a collective decision and the only thing that can be said is that a majority voted, after prolonged discussion where every single member of the Council—for the first time, in my limited experience—participated in the discussion and came to the conclusion that the award should not be withheld.

There were other considerations involved, of course. Were the members dealing only with this instance? Were some of them concerned about how we could cope with future similar cases? It is not possible to say. But it is a fact that a vote was taken by a widely representative body of well established Canadian citizens who considered all aspects of the case and this is a very important element. It is not correct to think that the Canada Council simply ignored these problems. The Council in plenary did not discuss anything but precisely these issues and after lengthy discussion came to the conclusion that the award should not be withheld.

I do not think it is possible to go beyond that in this case.

Senator Robichaud: Thank you. I have other cases in mind also, but rather than discussing them publicly I would like to discuss them privately with members of the Council.

Senator Carter: Mr. Chairman, I would like to carry on with the points raised by Senator Robichaud in his questions. I would like to

take them one step further. One of the witnesses spoke about the assessment of candidates or applicants. When you make this assessment, do you do so on the basis of the usefulness of this man to society or to his country or is it simply related to his scholarly ability? It may well be that his scholarly ability is an asset in one direction, but it may be negated in other ways. In fact he may just be a clever rogue if his attitudes towards society are wrong.

The Chairman: But, Senator Carter, what is right and what is wrong?

Senator Carter: Well, take the person who has an adverse attitude towards law and order. I would say that he is wrong. For example a person trying to undermine the basis of our society is wrong. Is his scholarly ability weighted so much that it overcomes all these other factors?

Mr. Martineau: That is exactly what some of us said, senator. That is why it was on division.

Senator Carter: Yes, it was on division, but every person apparently has his own scale of values in this. Apparently there is no scale of values set down by the Canada Council.

The Chairman: That is why we have a democracy.

Senator Yuzyk: But we can always lose our democracy.

Senator Grosart: And a democracy must have certain criteria. That brings me to the question I was going to ask. What are the criteria that are laid down? We have heard a great deal about scholarship, and I am the last one in the world to regard the criteria of scholarship as being unimportant, but there are other criteria. Is there any consideration given to the will of the public who provide the money for these grants and awards? I am not saying that that is an overriding consideration, but as has been mentioned, we are living in a democracy. Has any consideration been given to the questions of rightness or wrongness? It is all very well to say that it is difficult to decide what is right and what is wrong, but all our lives we are trying to decide that question. I feel we are entitled to ask the Council to undertake this same exercise. It is simply not a justification of this decision to say "we discussed it and we took a vote on it". It would be a wonderful thing, and I am sure the Cabinet would love it, if

all they had to say was, "We have discussed this very seriously. We are all good Canadians. We have reached this decision, and we do not want to hear any more about it." What are the criteria? Is there a list of them? This comes into this whole question of research and science policy.

I am asking: Has the Canada Council done any research on its own judgments? I do not mean, have you sat around and kicked around opinions. Have you hired a group to say, "Let us look at our decision-making process"? This is the research. Have you done it—yes or no?

Mr. Martineau: I am not going to answer yes or no. You are just asking me if I have stopped beating my wife.

Senator Grosart: The reason I said that—and I am sure the Chairman would like me to say so—is that we are all impressed with the all-star team the Council has brought, but some of us pitchers down here are finding it very difficult to pitch to three batters at the same time.

Mr. Martineau: I have been there five years now, and it is the first time that a case like this has come up, but we had only to judge by the academic excellence of the candidates, and also the value of their project when it was in research. So, we look at the subject and the man, if he is capable of doing it, and if he were tops we would say, "Yes." We have never had the R.C.M.P. after them, to see whether they were faithful to their wives, or were married, or to investigate their morals. We did not look into that. But this time the Gray matter came up and it raised new questions which were discussed, but we have not up to now decided on any criteria. Maybe the Council will have to, but up to now this is the first time we have thrashed it out. If it happens again some criteria will emerge.

Senator Lang: Did the Canada Council deliberations on Gray's application precede or ante-date the recent tensions at McGill and the march on the campus?

Mr. Boucher: They followed. The march was on the Friday, and the Council met on the Monday.

The Chairman: And Tuesday.

Mr. Boucher: His timing was beautiful.

Senator Carter: One of the witnesses said this morning that you perhaps have 3,000 or

4,000 applications for doctoral fellowships, and only 2,500 available, or something like that. How do you allocate them in such a situation? What is the basis of your allocation of the various scholarships in the various subjects? How come you have only a certain number one year? How do you decide you are going to have "X" doctoral fellowships and "Y" something else?

Mr. Martineau: We make up our budget, and we have so much money which we have to divide, and we divide it between arts and sciences, let us say, 19 and 11, and when we come to social sciences we divide it again, according to the advice we get, between grants to students and research. Then, after this division, if we have, let us say, \$3 million to give to doctoral students, it means if it is \$5,500 per man, that there will be only so many fellowships. So if we have 1,000 demands for them, we have only, maybe, 500 to give out of this money, because we have to keep within our budget.

Senator Carter: You make an arbitrary decision, first, between the humanities and science?

Mr. Martineau: No, I would not say it is arbitrary. As with all budgets, we try to divide according to needs the money we have. It is the same in the arts: you have music, theatre, dance, and this and that. So we are trying to make a fair division according to needs, but no one and no discipline is entirely satisfied.

Mr. Boucher: In the case of doctoral fellowships, the amount earmarked for them has been arrived at based on the estimated requirements. We have been going to the Government for the past few years asking for a certain amount of money, predicated on the flow of demands we anticipated and the rate of awards we regarded as adequate. So, when the Government decides that we can proceed with this kind of estimate there is already an allotment for doctoral fellowships set at a certain figure based on our anticipation of what the next competition is going to yield. If the number of applicants is greater than we had budgeted for, there will be fewer awards to applicants in that competition because by that time we do not change the budget, as the rest of the money is earmarked for other purposes.

Mr. Martineau: If we do not—as we did not this year—get the money we were expecting, it throws our budget off.

Mr. Boucher: We cut everything.

Mr. Milligan: Senator Carter also asked about the allocation by discipline. In fact, in the doctoral competition we do not distinguish between the humanities and the social Sciences, and we take it discipline by discipline.

What happens is that in each discipline there is a selection committee, or in the case of the very small ones two or three may be lumped together under a single committee. The applications related to that discipline are allocated to that committee. At the same time they are given a quota. That quota will be a uniform percentage quota for each committee. If the committee finds that the general calibre of applications is very high they may say they would like to have more and, in some cases, we may increase it slightly. In some instances the committee may say that the quota is excessive in terms of the standards they are applying and that they do not need all the places. But the quota allocated, in each case, is a uniform percentage quota for each committee.

Dr. Slater: I think it is important to keep in mind where this fits into the total picture. The Canada Council doctoral fellowship program is the tip of the iceberg in support of graduate students, the good graduate students. This is the major national prestige award program. Therefore, for Canadian citizens and landed immigrants, in every field of study, it is going to be the better group that comes up. We are starting from the better group. We do not even put in from our university a certain range of the middle cut of students. They are good students and should be there, and I defend them, but they are not candidates for Canada Council support.

There is considerable consciousness among the Academic Panel and Committee, etcetera, as to what is the quality of people getting awards in this field versus that field. There is a feed-back process, therefore, and if it turns out that people who are absolutely first-class are not getting awards in one field, and people who are good but are not absolutely first-class are getting them in another field, then you ask questions. So, there is a feed-back process, and this is the sort of thing one hopes will work out with a good feed-back process to produce a good result over a run, let us say, of two, three or four years, recognizing that you can never get the thing quite perfect in any year.

Senator Lang: Mr. Chairman, I want to go back for a moment, if I may, to the evidence given by Mr. Boucher. First, he emphasized the extent of the support given by the Canada Council to the social sciences, and the rapid increase in that support over the last four or five years. Secondly, he acknowledged the fact that it was amongst the social science postgraduates and, I guess, the undergraduates that we detect what we might call the largest degree of behavioural aberrations in activities at the university. If I interpreted his remarks correctly, he also suggested that the reason this is so is because the social scientist does not find a constructive outlet for his expertise in our society—in fact, he may not be able to utilize his talents to the extent that are desirable in our society today.

I may be wrong in my premise there, and I stand to be corrected, but if that is the case do I not detect in that evidence the suggestion that we may be putting too much support behind the social sciences today in view of the present development of our society and the ability or willingness of our society at this stage of our development to absorb these talents adequately.

If you concur in my conclusion, how then can the Canada Council justify the rapid increase in expenditure for support in this particular area?

Mr. Martineau: We discussed that very question last night, so answer him, Mr. Boucher.

Mr. Boucher: I think I would have to start by saying that what the Canada Council does at the moment in supporting students who are already engaged in doctoral work in the social sciences and the humanities does not quite support 40 per cent of them. It by no means gives full backing. It is not in a position to give full backing to those who are training themselves for future careers in these fields.

In the field of support of teachers who are engaged in research, we barely support ten per cent of those who are already engaged in a career.

So, the Canada Council is still a long way from the point where it would start asking itself very seriously whether it has got too much money. What we can do with the limited funds that we have, in view of the segment of our parish that we can service, is that we can insist on quality, and we do insist

on quality. We try to help the best within this universe.

How will society eventually make full use of these people is very difficult to say, but perhaps I could say one or two things. If you look at the natural sciences the thing you notice almost immediately is that while people are being trained in abstract disciplines such as chemistry and physics, there are also people at the same time who are being trained in engineering, so that for a long time now the people who have gone into the physical sciences have been able to make a choice between getting a degree, and even a higher degree, in pure science or in applied science leading to certain recognized professions in society. But society, as I said earlier, has not quite sorted out what use it can make professionally of the people who are trained in the pure disciplines.

The N.R.C. is talking now of producing a report whereby it may be shown that it is worried about the use that will be made in four or five years time of certain persons trained in the physical sciences. This to me sounds a bit like what was being said in the early thirties. Any of us who would have been asked then: "How many social workers can we afford?" would have come to the conclusion that we could afford none. We would never have justified setting up our schools of social work, because you cannot project employment from an almost non-existent demand.

For a good while the social sciences, very largely because they were terribly sensitive about their scientific capacity to compete with the natural sciences, shied away from the development of applied courses. Industrial relations started developing, and social work, but the social science people were trying to make a point of not developing anything which would resemble social engineering, so we are still very largely living with this problem.

If you try to understand why young people join a faculty of social science you will see that very few of them are scholarly minded. They are all reform minded. They all go there to change society. They are the people who are socially motivated, and they are action-oriented people. What the universities do with them very often is inhibit them so much that they are no longer good action people and, if they did not have it in them, neither are they very good scholars. So, this field of development is going through a very

difficult phase, but personally I would certainly hesitate to express concern at the moment about our over-production of good people trained in these disciplines.

I think very severe difficulties for these people will have to be met in finding their proper role and their proper acceptance by society so as to allow them to perform effectively. There will be an amount of waste for a while, but this is a bit like running an immigration program. You bring in immigrants to this country, and for a while some of them will have difficulty in performing to their full capacity. There will be some adjustments. There will be some hardship, but you have to have faith that our society will eventually be able to develop ways of using all of these people to the best of their capabilities.

The Chairman: Before we go on I would like to point out that it is now 12.30, and I have the impression that you still have a number of questions to ask. Would you like to adjourn now, and return this afternoon—and I understand our guests are willing to do that—or would you prefer to go on until one o'clock and complete the business for today?

Senator Haig: Let us adjourn and come back this afternoon.

Senator Lang: I have just one more question, Mr. Chairman.

The Chairman: I will allow you your question, but what are the views of the other members of the committee?

Senator Grosart: Depending on the time relationship between the pitcher and the bat, I hope we can get through and finish up at one o'clock. Two short answers would help.

Senator Lang: I am rather a sanguine person in asking this question. I for one am very sorry to learn that Mr. Martineau will not be seeking reappointment as Chairman of the Canada Council, because I think he is the kind of person in whom we all take pride in having as chairman of this body.

Mr. Martineau: Thank you, senator.

Senator Lang: That being the case, I think he probably has attained a degree of objectivity already, even before his time has expired, and I would like to ask him, if I may be so bold, whether he would try to give us his objective assessment, as a layman and a lawyer and not as a chairman of the Canada Council, of that body's relative strengths and weaknesses today.

Mr. Martineau: Yes, I will, senator. The trouble is, I just love these dangerous questions! The Council is as strong as its members are and as strong as its officers are. I will start with the officers. We have officers like no other institution in Canada, and I say that not because they are here but because it is true. We have extraordinarily good officers in every field; they are outstanding.

The Council is only as good as its members. Its members must be chosen with extreme care. The chairman of this Committee had to choose them at times, and, if I may say so, once a member was chosen whom later we would rather not have had, who added nothing to the Council.

The Chairman: I will remember that.

Mr. Martineau: You have asked me the question, senators.

The Chairman: You give me the name and I will give you the background.

Mr. Martineau: I know the background. Generally speaking, by far the majority of the members have been excellent. The level of discussion and the disinterestedness of every member, except for the one to whom I have just referred, who did not last long, is absolutely admirable. The fact that we all come from law, or this or that, makes it, I think, a perfect blend. Mind you, at times the discussions are very tough, as they should be, but we usually come to some conclusion, because we are all open minded. It has worked wonderfully. When I think of what Canada was before the creation of the Council and before your chairman gave us the first \$10 million, I see now another Canada, thanks to the Council. I think that what you must do is try to give it more money, and for the ministers always to appoint good members, then this magnificent work will continue. This is what I believe, and I would be very sad if I saw the Council doing less than it is doing today, because what it does it does magnificently, even though, of course, it is human, like every other institution.

Senator Grosart: I have two questions which would seem to relate very closely to the work of this committee. They arise on pages 7 and 23 of the brief. On page 7 there seems to be a feeling on the part of the Council that there is something wrong with research contracts. The words used are "tempted" and "blandishments of research contracts". There is a contrasting statement

that departments should buy the research they want and not set themselves up as sponsors of research. We are often told the modern trend is that governments, of which departments are components, are the new *Médici*. First of all I would like to know the Council's objection to the funding of research by contracts, particularly in view of the fact that we are continually told that the American pre-eminence in the research field is due largely to funding by research contracts.

Mr. Boucher: The answer to that is simply that we are very sorry the text is obscure in that respect. We have nothing against research contracts.

Senator Grosart: They are called blandishments.

Mr. Boucher: We have nothing against research contracts except in the sense that they are more attractive, and at times possibly unnecessarily more attractive, than research grants. They provide the kind of support that research grants cannot provide, namely stipends. If you want to do something and turn to the Canada Council or to the NRC for support, these agencies will be able to pick up the expenses but will not increase your income. If instead you go to a department, and if instead of getting a grant for the department you can convince them to give you a contract, you will not only get your expenses paid but you will get paid for doing it.

Senator Grosart: Is there something wrong with this?

Mr. Boucher: There is nothing wrong with Government using contracts. We have no objection to that. The meaning of this is that we feel the Government should contract; that is what we mean when we say it should buy it. It should buy it through contracts.

Senator Grosart: I do not want to labour the point, but there seems to be a contradiction in the two statements.

Mr. Milligan: There are two additional points I might add. One is that in some cases what purport to be contracts and carry with them a stipend are in fact only grants.

Mr. Boucher: That is right.

Mr. Milligan: It is, if you like, a form of unfair competition.

Senator Grosart: Unfair competition with whom?

Mr. Milligan: With granting agencies like the Canada Council. It puts us at a disadvantage.

Senator Grosart: Not unfair competition with people seeking help?

Mr. Milligan: Not with people seeking help. The other point is that when the government departments enter into the grant-giving business they do so on a much smaller scale than we do, and certainly on a very much smaller scale than the National Research Council. They are not bodies that are particularly devoted to this particular function of supporting research. They do not have the same kind of procedures, the same kind of expertise if you like, that we have. Quite frankly, we feel they do not do the job of giving grants as well as we can do it.

Senator Grosart: This is not what they have told us. They have told us that they have the expertise; that they examine these things and they know what they are doing.

Mr. Milligan: They tend to rely very heavily on their own internal expertise, which is vastly inferior to the kind of expertise we are getting from all round the world in making assessments.

Senator Grosart: It is a very surprising statement that shocks me in view of the millions and millions of dollars now granted for the funding of research on the basis that you now criticize.

The Chairman: Not money in the field of social sciences.

Senator Grosart: I am not merely speaking of social sciences. It is a very serious criticism that has just been made of the funding of research by departments of government. We are told it is not as well done as by the Canada Council. We are told they have not the expertise. It is a fantastic criticism.

Dr. Slater: Time is getting on and it would take me far longer than we have left to reply. I could not provide Senator Grosart with a short answer. However, from experience of having been a grant holder and a contract holder in Canada and the United States, and now signing for research contracts, signing all grant contracts and trying to make the things fit together, I think I could provide some sort of useful background. I will undertake to furnish a supplementary statement on this, as a personal matter, not as a Canada Council matter.

Let me say, in short, you cannot run a really good research and teaching establishment unless you have got a reasonably secure central operation which has an ongoing basis and is funded in terms of general objectives and does not have too many strings attached. You can attach to this a lot of contract things on quite an effective basis. There are problems of fitting them together. You have got to simply realize that there are the problems of fitting them together and coping with them. We know something about how to put them together. I do not think it is right to say that we have done all that well in this country yet in fitting these things together. I think there are probably far more weaknesses in the contractual side of research support in this country at this stage than there are in the granting side. There are a lot of abuses. We think we know something about these, and I believe we know something about working them out. Perhaps to some extent this relates to another matter again, and I will try to make a personal statement as distinct from a council statement.

Senator Grosart asked a question about a ministry of science, and so on. I am going to argue very strongly in a separate statement, and I will file it with you, for approaches of co-ordination and relating things. That does not mean to say that it is a monolithic structure. That really itself would be very, very wrong. I am going to argue this from what may be a unique experience in Canada. I am a member of the principal granting body supporting, not only universities, but art galleries, museums, et cetera, in Ontario, and therefore have to see that side of the thing. I am also concerned now with certain aspects of the federal side and one of the few people that happens to be, in a sense, in a position to be actively involved in both of these things and not just in advice, in making decisions and spending money and taking responsibility for it. I am convinced that we are desperately short of effective communication and integration as well as co-ordination of many of our programs. The Canada Council has had difficulty in understanding what the provincial thrusts are and the provincial activities are different from the national activities. There have been enormous efforts to relate these. Improvement is needed and fitting together. In this connection it is similar to the kind of issues that arise in relating contract activity and grant activity.

Senator Grosart: There have been some very thorough-going studies of this made in

the United States. It is not a new subject. This brings me to my second question which relates completely to this. On page 23 there is a reference to the Macdonald study. I gather that the Canada Council is a bit disappointed in that study. In section 41 I read that the council is now faced with a need for inventory of research in the social sciences. I think this committee has been much engaged in the problem of activity inventory which is the main reason, I suppose, for the back of co-operation and co-ordination that Professor Slater speaks about. What is the particular deficiency in this respect of the Macdonald report?

Mr. Boucher: A few months before the Macdonald report study was launched the Canada Council was deeply engaged in discussions with CAUT and AUCC to stage a survey of sources of financing of research for our area of jurisdiction, the social sciences and the humanities. What we wanted to know was what were we competing with? What was our role in the total picture? In order to define our role and especially for the future, we had to know how much money was pouring into the research community from foreign funds and Canadian funds, from contractual sources as well as from free sources of support and what all of these various forms of support covered and what restrictions were applicable. This is a field on which no one has full information. We were discussing this and were about to come to the conclusion that it would be difficult to do the survey unless we could also persuade the natural sciences to come in with us.

We then learned that the Science Council was staging the Macdonald survey and that Dr. Macdonald found it difficult not to go over into the social sciences. We came into the picture as partners with the Science Council to support the Macdonald survey in the hope, if not on the understanding that what we were after would be gathered by the Macdonald team. Well, it turns out that it has not been gathered. The Macdonald report will not tell us more than we knew three years ago about that and we are still asking ourselves what is the role of free grant or grants to freely initiated research in the total picture. How much income do researchers make through contracts and through consultant fees, and so forth?

Senator Grosart: Is this largely in the social sciences and humanities?

Mr. Boucher: I do not think the humanities have much of a problem, but what we think is a real problem—that is why we are concerned about certain forms of contracts and grants—is that of certain disciplines, let us say economics, to take one. The market situation for putting an economist on tap and getting him to work for you is such that an economist may well go on through his career responding only to contractual offers and quite possibly never undertaking what he himself would very much like to do, provided he had the same kind of financial support from some free source. We are somewhat concerned with the approach of government departments to financing research. We believe that when departments have identified a research gap that they need to have filled in order to meet their political requirements they should buy through contracts the services of researchers. This is perfectly acceptable and it should be encouraged. We feel on the other hand that when researchers want to do what they wish, when they have the possibility to turn to a department and say, "Well, now, do you like what I want to do and are you prepared to give me for that the same kind of support you would give to somebody you hired yourself of your own initiative?" This kind of possibility is somewhat disturbing, because in this way there is a tendency to distort the natural direction that would be taken by career scientists and especially for these special disciplines which at the moment are subjected to a great deal of solicitation. There is also the fact that in the United States grants given by foundations, even grants given by the National Science Foundation, are grants which carry a stipend with them. This means that while there is no doubt at the moment that a philosopher is not the object of multiple offers, certain very important people in our research community are subjected to this kind of solicitation.

Senator Grosart: Excuse me, is it your feeling that there should be a single agency responsible for the control or co-ordination of all grants for free research?

Mr. Boucher: I am not sure that we would put it in black and white, but I think the rule should be in departments that research would be either in house or under contract; that when a department requires it, it would contract; and research by grants would generally be supported by a research council, that grants would be the means which would characterize the research councils.

Senator Grosart: But is there not a very close relationship? We find over and over again that innovation or technological research projects feed back to the need for some basic research.

Mr. Boucher: Yes.

Senator Grosart: Are you suggesting that if this happened, departments should be denied the opportunity to say they need some basic research?

Mr. Boucher: Not at all. Of course, we have to be quite clear that our major concern stems from something that is very largely peculiar to the social sciences, and very largely peculiar to only some of them—primarily things like economics. We have a feeling at the moment that one of our responsibilities may well be to make grants for freely initiated research reasonably competitive with research contracts—reasonably competitive. We would like the first class economist to be able to state what he wants to stage and get the kind of support for that which would be equivalent to what he might get if he simply looked around to get a contract—he does not have to look very far.

Senator Grosart: Do you see any hope on the horizon for a complete inventory of funded research in Canada? Does anybody see it?

Mr. Milligan: Not on the immediate horizon, but I think it is going to be essential within, say, five years.

Senator Grosart: Do you not think it essential now?

Mr. Milligan: It is essential now, but the means do not exist. There has to be a coding system if it is to be machine-readable. There is no coding system available which would serve a bilingual country. Not only that, it must be compatible with international systems, because this is part of the international activity. What is desperately needed is an international coding system which is immune to language, which is immune to the labels given to disciplines, which is concerned with the actual substance of research—so that any man working on research can find out where in the world—not just in this country—there is research being done on this project, where and by whom.

Senator Grosart: This is a different type of inventory to that which I had in mind. I had intended to speak only of a Canadian funding. If there are 20,000 of them...

Mr. Milligan: I think the basic need is the other one. The kind of information you are seeking can be a very simple by-product, once the basic end is achieved.

Senator Grosart: Surely someone can make up one for these 20,000? Evidence we have had from departments is that when they sit down to decide they will give a grant to university X for project Y they have not the faintest idea what is in the estimates of any other department. I know we have had that evidence over and over again. That is the kind of inventory I speak of. It is a paper inventory.

The Chairman: Only within the Government?

Senator Grosart: Start with the Government, but a natural corollary would be the funding by industry and the Canada Council.

The Chairman: You will remember, Senator Grosart, that we had a long discussion about this with the Dominion Bureau of Statistics and they are supposed to work on this. I remember that we were expressing at that time the fear that they could not co-ordinate, even in that field, their activities with other government agencies. If we cannot co-ordinate in the gathering of figures, I do not think we will be able to co-ordinate very much when we come to the formulation of policy.

Senator Grosart: A very profound statement, Mr. Chairman, and I entirely agree.

The Chairman: In any case, I would hope that the Canada Council, when it embarks on this—and it is a very desirable objective—would be prepared to co-operate at least with the DBS.

Mr. Boucher: Certainly.

Senator Grosart: I have one final comment. The Canada Council seems to show some concern in people worrying about the role of the Treasury Board in science policy decision-making. May I assure them that there are very few subjects which have concerned us less than the Treasury Board, because if we find anybody in trouble in questioning by this committee, they almost always say that it is the Treasury Board which makes the decision.

Mr. Boucher: The point we were trying to make is not so much that. We are aware of course that the Senate committee has had two

sittings with the Treasury Board, but abroad in the country there has not been too much discussion of the kind of problems that come up with a following through of the PPB exercise. This is what we feel we will have to come to at some stage. The question that has to be asked is not how much money we can afford to spend on research, but how much money we can afford to spend on research compared to what we have for other purposes, and how much we can afford to spend on other objectives. It raises very much the whole question of broad priorities that that exercise could help us resolve. To some extent the Treasury Board has given a good deal of thought to using the method as a tool to analyze priorities within programs or within a single department, but not in any inter-related fashion across the whole spectrum of federal expenditures.

Senator Grosart: So that the problem now is not merely annual decisions but five-year projections which can throw the whole thing

out of kilter, far more than it is out of kilter now, if that is the position.

The Chairman: As there are no other questions, I wish on behalf of the committee to say I am very pleased indeed to thank the chairman and his associates for spending all that time with us this morning. I hope that we will have other opportunities, when he has retired from his present responsibility, to hear Mr. Martineau and to profit from his great wisdom.

Mr. Martineau: Thank you, Mr. Chairman. In the name of every member of the Council and the officers of the Council who are here this morning, thank you for your courtesy. Let me assure you that the questions which you put to us will not be forgotten. We will certainly be thinking of them and we will try to satisfy your just doubts, and that is all we can promise. Thank you again.

The committee adjourned.

APPENDIX 49

CANADA COUNCIL

BRIEF TO THE SENATE COMMITTEE ON SCIENCE POLICY

April 24th, 1969

CANADA COUNCIL
BRIEF TO THE SENATE COMMITTEE ON SCIENCE POLICY

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Special Committee

BRIEF
PRESENTED BY
THE CANADA COUNCIL
TO THE SENATE COMMITTEE ON SCIENCE POLICY

PART I: GENERAL COMMENTS

Scope of the Council's Brief

1. The Council had the privilege in March of last year of being the first witness before the Committee. Now that many views have been presented, the Council can put before the Committee more useful observations than those offered at the first sitting. This it wishes to do in Part I of the present brief. Part II will answer the questionnaire distributed by the Committee last September to the extent that it bears on grant-giving programmes.

2. The attention of the Senate Committee has been and will continue to be drawn mostly to the natural sciences, to R & D in government and industry, and very much to development and innovation. Because of its mandate, the Canada Council must try and direct its remarks to research--to research in the social sciences and humanities and to research in the universities. Reference will therefore be made to the broader issues only to bring out more clearly the point of view of university research and of the social sciences and humanities.

3. A national science policy must embrace policies adopted and administered by non-governmental institutions such as universities, hospitals and industry. However, for the sake of brevity, this brief will treat science policy only in so far as it is a responsibility of government.

The Broader Context

4. Why do governments these days feel that they should have a science policy? Is it because they do not have one or because the one they have lacks coherence or is inadequate? Is the present policy inadequate because it is too timid and restrictive or because it is too unconscious and uncontrolled? Is it felt that science expenditures in Canada are too timid because they underuse Canadian talent, because they leave too many problem areas (mostly social) unresearched, because well before the year 2000 they will have pulled us out of international competition, or simply because they do not add up to 3% of the GNP? Is it felt that they are out of control because the pattern of governmental research does not reflect the balance of political priorities, because it shows wasteful overlaps and gaping holes, or simply because Cabinet has had to discontinue two or three of the more expensive projects? Is the government sharing the new suspicion that science could be easily as harmful as beneficial to society, that it should be kept in tighter check, or does the government believe that the non-use of science could be as harmful as its misuse, that the challenge lies not in slowing down the germination of new ideas but in taking more systematic and responsible advantage of them?

5. Asking ourselves, as a nation, not how we can best use new knowledge, but whether we can afford more research is not unlike asking ourselves whether we can afford to go on thinking, since research is only the systematic application of the mind to the solution of problems. Of course, we may well ask ourselves whether we can afford to let scientists have their own way at public expense, but then we must be prepared to ask ourselves

as well whether we can afford not to. In the end, the only valid questions in the research sector of science policy may well be how to achieve quality and weed out mediocrity, and how to husband, in and out of Government service, scarce and precious resources essential to national advancement.

Government as a User, Maker and Supporter of Science

6. A satisfactory science policy cannot be achieved unless distinctions are made between the different roles performed by Government in its association with science. This is required to reveal the different motives which will guide Government in its attitudes and choices. It is often said, for example, that there is a difference between a science policy and a policy for science, or between a policy for the use of science and a policy for the advancement of science. But the practical implications of such a distinction for policy-making are seldom pursued. Actually, a government may be interested in science either as an instrument--as a tool for the achievement of broader social goals--, or as a national activity of intrinsic value. In the first instance, the government is a user of science or acts on behalf of the nation as a user of science. In the second instance, the government may be involved in science either as a public entrepreneur or as a supporter.

7. A good deal of the growing interest in a science policy can be traced to various attempts to have governments make more conscious use of the sciences in the pursuit of their political objectives or in their support of the broad objectives of the nation. This concern is widely shared by all those who feel the need for more effective action by governments or by publicly assisted institutions to resolve problems of growing

complexity and generally to achieve greater prosperity and welfare. Such a policy is directed at making national institutions ever more scientific in the discharge of whatever responsibilities they have assumed, and more particularly at making them ever more innovative. The emphasis here lies much more on development and innovation than on research. It is also very important to recognize that in so far as the government is a consumer, not a producer of science, its science priorities must be equated with its political priorities.

8. There are two other ways in which governments may be involved with science, this time not for its instrumental but for its intrinsic significance. Science is quickly becoming a major component of the total national activity. Along with other creative endeavours it will occupy a more and more important place in a post-industrial society. Provided that society is geared to using its findings well, it will be capable of achievements of which we would not have dreamed before. More simply, it will occupy an ever-growing segment of the service side of the national economy. The leisure society will also be the scientific society. Leisure will largely be the privilege of the "working class" of to-day and a large share of the work will be done by the intellectually trained, who will make up a growing segment of the economically active population. Two consequences have begun to flow from this trend, one involving the State as an entrepreneur of science and the other, the State as a supporter of science.

9. As an entrepreneur, the State is led to undertake scientific activities not so much because they will assist in the discharge of its other responsibilities (although they may), but because certain scientific

undertakings are of such magnitude or character as to require governmental initiative, somewhat as is the case for public utilities. Science in this sense becomes another national service, a "mission" in itself on the government agenda. It can be concerned with research as well as development. Policy formulation is specially required here both to bring about more determined action in areas where continued neglect could soon spell disaster (such as greatly expanded scientific information services by DBS and the National Library), and to ensure the gradual decentralization of long-standing programmes (astronomy, nuclear physics, econometrics) when conditions which brought about government action in the first place have changed sufficiently.

10. The second consequence that flows from the growing significance of science in our lives is that governments are now led to support university research no longer through sheer benevolence but through a sense of public responsibility for the health of a vital sector of the nation. Science is no longer a luxury consumer good but a fundamental prerequisite of contemporary society, and support of research as a national activity must be regarded as an investment in the building up of the social infra-structure. It also constitutes a mission in itself. Although it does not carry the same vote appeal as education, it is the most meaningful implication of a policy of universal education aimed at producing citizens who can not only assimilate knowledge and imitate foreign innovations, but advance knowledge and innovate themselves, especially in the social areas, where imports are not as easily assimilable. The work of scientists and scholars is then supported not so much for the immediate or remote contribution that as a group they will

inevitably make to the growth of the GNP but because they already exercise in the nation a service occupation of the highest social significance. Whether or not governments can find in this enough of a political justification for public expenditures, they can always invoke more pragmatic grounds such as the need for strengthening universities, for training scientific workers required by them and by business, or for providing democratic safeguards against their own monopoly of knowledge.

Social and Scientific Priorities

11. A science policy requires criteria. Can these be the same for a user's policy, an entrepreneur's policy and a supporter's policy? The Science Council has suggested that certain objectives identified by the Economic Council as social priorities might be taken as the objectives that would justify special government association with the work of scientists in these areas. But the Science Council does not say when scientific priorities can be equated with social priorities, and when they cannot. Of course, governments will not arrive at a satisfactory policy as users of science unless they can define their own and the nation's broad social objectives. But these national goals will not help them define their roles as entrepreneurs of science or as supporters of science. The reason is that these roles must find their justification in their acceptance as social objectives in themselves. Unless governments are careful to make this distinction, their interest in science could become ambiguous. It might come to lie merely in the buying of time while a political consensus develops, rather than in the need for expert advice. What science, or at least the natural sciences, could contribute further to the understanding of pollution may well not be

what governments require to take action. While the research done on behalf of recent royal commissions and task forces has probably been of high scholarly significance, it can hardly be claimed that it was all required to provide assistance in the decision-making process. Governments themselves may begin to worry about the possibility that royal commissions will come to mistake scholarly inquiry for public enquiry. Scholars may begin to worry about the unpredictability of this source of government support.

12. Governments are already too often tempted to mobilize, through the blandishments of research contracts, as large a sector of the research community as they require for investigations which are politically imperative. In the process, insufficient use is made of the best scientific talent and free research itself may be stifled. Governments are not unaware of this danger but quite naturally find it difficult to ignore political requirements simply to protect an academic freedom which by itself offers little guarantee of great scholarly activity. The fact is that academic freedom is merely a pre-condition of scholarly achievement; it remains largely a fiction as long as the means to engage in effective free research are not provided. Free scholarly activity in the social sciences is at a critical juncture at the moment. The community of scholars is only now beginning to seek Canadian grants instead of American grants and Canadian contracts, but it is still hesitant to undertake large projects. Government departments would be ill-advised to discourage this emancipation process from which they can only benefit eventually. It is a good thing for scholars to have access to multiple sources of support but departments which need research should buy it and not set themselves up as patrons. It is doubtful that they need offer

special fellowships in the social sciences beyond those offered by the Canada Council, or that they need offer special research grants beyond their own research contracts and the Canada Council grants. It is even more doubtful that they should offer contracts in lieu of grants. This practice is particularly open to question since the provision made in research contracts for stipends, which the Canada Council cannot provide, only aggravates the non-competitive situation of the Council in making grants for freely initiated research. Even the mission-oriented nature of a research project is not sufficient to make it exclusively a departmental responsibility as this would have the undesirable effect of limiting Canada Council support to purely theoretical research. If the granting of funds to government departments for the assumption of a purely supportive role warrants review in mission-oriented research, it does the more so in areas where departments have assumed a protective responsibility for whole scientific disciplines such as geography, labour economics or mental health.

Framework of a Supporter's Policy

13. It is the Council's conviction that a programme of aid to free research should not and, in practice, will not concern itself with distinctions between "right" and "wrong" areas of inquiry. There is just no evidence that the problem is that too much money is being spent on the wrong kind of research. We have even less assurance that the wrong kind of research in terms of immediate social utility would be the wrong kind of research in terms of scientific significance or even of eventual social utility. Such a programme of aid must concern itself, however, with distinctions as to the quality of research. We may quite rightly fear that too much money will end up

being spent on mediocre scholars. We must accept to support a fair number of researchers of ordinary competence if we are to attract the exceptional ones, but there is no justification for supporting applicants who appear mediocre at the outset. We must work, then, at tightening the screening procedures, developing an even more demanding system of pre-assessment and of progress audit and post-audit. From a purely managerial point of view, it is both necessary and not unduly expensive to have a sound pre-audit system of universal coverage, but the coverage of a review system must necessarily be limited to sample checks. It can only guide the granting agency in its future decisions and then only in general terms. Also an audit system should not be expected to exclude from future aid all applicants who have failed to reach their stated objectives, unless it reveals mediocrity that had escaped earlier scrutiny. The possibility of failure is inherent in all original research. As to cost-benefit analysis, whatever progress can be made in this respect will definitely be useful. However, university research must include the scientific as well as the social benefits, however more difficult the former are to quantify. In any instance, most progress made in this field will come ex post facto from specially trained observers rather than from individual scholars applying for support.

14. Over the past decade, the science expenditures of the industrialized nations have been growing at a considerably faster pace than the Gross National Product. The time was bound to come when governments would be asking themselves how long the trend could last. If governments to-day are having second thoughts about the pace at which scientific programmes can be allowed to grow, it is to a large extent due to the return of economic

uncertainty and to the abrupt accumulation of unmet social claims, old and new. The question, then, is how much will the merits of science expenditures weigh against those of social claims; the question also is how will governments choose between the cost-benefits of enabling measures and those of protective and remedial measures. To assess the social significance of science, we must ask ourselves why we have recently been letting science support grow by leaps and bounds. What were we trying to achieve? A simple and reasonably accurate answer would probably be that we were trying to bring the volume of scientific activity in the life of the nation to something like a critical mass, and that we regarded this expenditure as an eminently well-timed social investment. If this was so, how far are we still from the target and, in the case at least of the social sciences, how quickly must the target be reached if we are not to jeopardize the fulfilment of other social objectives?

15. For the last five years, the Canada Council has been trying to formulate, in its budgetary forecasts, targets related to what could be considered a basic level of support for the social sciences and the humanities. While the Government's response has been quite encouraging and has now brought the Council's budget up to the level where the NRC-MRC budget stood only six years ago, it has at the same time improved the position of natural scientists considerably; whereas the Canada Council can now support almost 10% of its universe of career scholars, nearly two out of three natural scientists are being supported. The Council's submissions to Treasury Board have been expressed in terms of requirements to assist, through research grants, a reasonable segment of the research community and,

through doctoral fellowships, a reasonable segment of the career researchers in training. To this, allowances have been added for the launching of a scientific information and communication system, for the rapid build-up of essential research collections, and for a programme of key institutional development grants. It must be realized that something like an annual 20% increase is required just to keep pace with the population growth on Canadian campuses and with cost increases. The Council remains of the view that while its position has been quite remarkably improved over the last five years, the recovery operation, by which the gap between the natural and the social sciences would be gradually reduced, has made very little progress. Unless its budget is doubled once more over the next two or three years, there is a grave risk that the expectations of its research community will be dashed again.

16. The Council believes that the search for an adequate science policy, if it is not to remain in the abstract, must be linked with the overall review of government expenditures which is now the object of the Planning-Programming-Budgeting scrutiny in the Treasury Board. It is disquieting that so little of the discussion that has taken place to date on the issue of a science policy has dealt with the Treasury Board and with its work on PPB. If Canadians want to know how much they should spend on science, they must be prepared to take an entirely fresh look at the way they have been spending money in the discharge of other governmental functions for the past several decades. It would be unfair and premature to comment in detail on the new experiment that Treasury Board is conducting. Still it must be said that PPB should offer choices not only within programmes

but also between programmes. Only a thorough questioning of all traditional patterns of expenditures will make it possible to see in proper perspective the significance (economic and otherwise) of the various roles that the Government of Canada will be called upon to perform in the years ahead, and more particularly how, to meet the new challenges, it will be able to recover enough freedom of movement from the very restricted position where tradition has cornered it. There is already ample evidence that it would be suicidal to take the traditional patterns for granted and let the new programmes bear the brunt of financial pressure. If the PPB analysis were allowed to run its full course, it would tell which government functions are preventive or protective, which are remedial and which are of an enabling nature. This would enable the Government to see that a programme of assistance to science is of the same nature as a programme of assistance to industrial development, that it is an enabling form of investment, intended to foster growth and to release creative talents of the best quality. Of course, it will never be politically easy for the government to make abrupt and radical changes in its pattern of expenditures.* But it should be able to make the most enlightened choices as to how to spend whatever little additional revenue it can scrape in the immediate future, whether in remedying social defects, in protecting us further from undesirable occurrences or in bringing about conditions that will gradually enable Canada to use a larger measure of its underused creative skills.

Science and Government Organization

17. The question of whether there should be a Minister of Science depends on whether one wants a Minister of Science to supervise a user's

policy, an entrepreneur's policy or a supporter's policy. If the sciences and especially the social sciences are to become, as they should, widely used instruments in the pursuit of broad national goals, it is difficult to see how a single Minister could discharge a promotional and co-ordinative role which must engage the attention of the whole Cabinet and Treasury Board. It is equally difficult to see how a Minister responsible only for the industrial use of science, but not for the wider field of social innovation, could properly be called a Minister of Science. On the other hand, with the growing acceptance of interdisciplinary approaches and the growing need for common services, a good case could be made, although it has not been made yet, for a single Minister (not called a Minister of Science either) having responsibility for all programmes of aid in support of university research, including the national information services of the National Library and the Dominion Bureau of Statistics. In Cabinet, he would speak on behalf of the university research and would assist his colleagues in ensuring a balanced distribution of departmental research contracts. It is generally understood that the President of the Treasury Board will, in time, relinquish his share of duties in this field, as in his new position he cannot indefinitely bear the responsibility for a particular area of expenditure. On the other hand, the Secretary of State is already responsible for the Canada Council, the National Library, and the administration of the programme of assistance to universities through fiscal transfers.

18. Of course, a programme of incentives for industrial research must rest with the Department of Industry as similar programmes in the primary industries must rest with the functional departments. But that does not

settle the question of free university research. While there is a case for the Secretary of State assuming responsibility for all university support, there is no particular logic in bringing the NRC laboratories under him. Yet neither is there any particular incompatibility. It is true that the proposal would appear to place the aid-to-science programmes further away from industrial application. But here one should remark that the recent literature has provided us with a very incomplete picture of the applications of science. It is by no means industry alone that must develop a sense for using the fruits of science. More and more it is other national institutions, such as the large service institutions, universities, hospitals, mass media, etc. It is true that these institutions use the fruits of science mostly in the form of industrial products, but it is quite possible that there would be even greater industrial innovation if science were more responsive to the needs of all service institutions than if it were directly associated with industry alone. There most probably would be greater social innovation. The same must be said of technology. There is a tendency to think of technology as if it resulted exclusively from research done in the natural sciences when a good deal results from research done in the social sciences. It is very difficult to-day to distinguish between the technological progress made, say, in the communications media thanks to the work of physicists and engineers and the progress made thanks to the work of behavioural scientists. Besides, most technological lags, even in industry, have a primarily social explanation. Shortage of innovators in industry is a social problem. Actually, Canada's scientific contribution to the world of to-morrow might

well prove more original and significant in the field of social innovation than in the field of physical innovation.

19. Whether or not all aid to university research comes under a single Minister, the various agencies of the Government that share this responsibility will have to develop closer and closer liaison in order to ensure complementarity between services and consistency between programmes and in order to foster interdisciplinary undertakings. It might be premature and, by Canadian standards, ambitious to envisage the integration of all research aid programmes in a single foundation for the sciences and the arts. Still greater use must be made of the social sciences by all governmental bodies engaged in the study of problems of science policy. Not only is the question of the social usefulness of work done in the natural sciences a socio-economic problem, so is the question of planning, costing and staging programmes either of scientific initiative or of research aid. How the Science Council will gradually resolve this problem remains to be seen, although the presence of a few social scientists on the Council must have already proven helpful. In any instance, before the mandate of the Science Council is expanded to embrace concern for the direction taken by the social sciences, or before a parallel Social Science Council is established, it might be wise to wait and see what the present Science Council can do for the natural sciences. The courtship has barely started between two scholarly communities equally richly endowed with prejudices. It should be neither interrupted nor rushed. They still can make more progress in common undertakings than in policy discussions. When the recovery operation undertaken by the Canada Council is well advanced, and when the gap between the support

granted to the natural and to the social sciences has been substantially reduced, various forms of government organization may well be re-examined with a view to effecting greater integration of parallel policies and to bringing all the sciences together in fuller partnership.

20. A decision on the advisability of establishing, along with the natural science laboratories of the federal government, a national social science institute would have to take into consideration the limited availability of top quality Canadian scholars in this field and, more particularly, the effect that this would have on the present programmes and plans of Canadian universities. The government would have to ask itself whether it is considering such an initiative as a user of science, as a science entrepreneur or as a supporter of science. The most promising solution would lie in the possibility that the government would be moved primarily by the third motive and that it would think of establishing an Institute not so much to have better research done on behalf of the government but in order to provide exceptional facilities where the best researchers might spend, on leave from teaching duties, various periods of time engaged in free research, a good deal of which could be of an interdisciplinary nature.

April 1969.

PART II: DATA REQUESTED BY THE SENATE COMMITTEE

Structure of the Canada Council

21. The Governor-in-Council appoints a Council of 21 members, including a Chairman and Vice-Chairman, and a permanent chief executive, the Director with an Associate Director. The Chairman and Vice-Chairman serve for terms not exceeding five years; other members for terms of three years; all may be re-appointed for a second term. The Council meets at least five times a year. (Appendix A gives the names and biographical sketches of members).

22. A key unit in the Council's programme of aid to research is the Academic Panel, made up of fifteen specialists broadly representative of all the social sciences and humanities. Outstanding scholars from universities in the different regions of Canada are chosen by the Council for membership on the Panel. Because membership of the Panel is rotating, the Council's programmes are reviewed critically by a somewhat different set of scholars each year. (Appendix B lists the names and university affiliation of members of the Academic Panel).

23. The Council's channeling of aid to research, is coordinated by the Social Sciences and Humanities Division. Headed by an Assistant Director, the Division is made up of 11 project officers and 16 supporting staff. Additional support is given by the Awards Service (6 officers, 9 supporting staff), which administers the annual competitions for Doctoral, Post-doctoral and Leave Fellowships, and the Finance Division, (6 officers, 12 supporting staff), which is responsible for the normal financial operations of the Council and provides data and analysis for programme planning and evaluation.

Adjudication Procedures

24. In the process of adjudication the Social Sciences and Humanities Division relies on the advice of many scholars, both as individual specialists and as members of a number of specially created panels. In the case of Research Grants, for example, there are almost three times as many scholarly assessors as applicants. Leading scholars abroad are sought for advice almost as much as experts at home, to help keep the Council's programme of assistance in line with international standards of scholarship. (The two charts of Appendix C show how these components work together in the adjudication of Research Grants and Fellowships.)

25. In addition the Social Sciences and Humanities Division, backed by the Awards Service, is responsible for the academic sector of a relatively modest programme of cultural exchanges with European countries, which the Council administers on behalf of the Department of External Affairs. Countries affected are Belgium, France, Germany, Italy, the Netherlands and Switzerland. Under this programme Canadian universities are offered grants to bring in outstanding visiting scholars from abroad and scholarships and fellowships are offered by competition to enable foreign scholars to undertake graduate studies or research in this country. Various committees here and abroad assist in the adjudication of candidates. (Appendix D shows how grants are adjudicated in this programme).

Ties with Parliament and Government Bodies

26. Created in 1957 by the Government of Canada as an independent body, the Canada Council reports annually to Parliament through the Secretary of State. The Council, which used to appear regularly only before the Public Accounts Committee of Parliament, is now also called before the Standing Committee on Broadcasting, Films and Assistance to the Arts. It

should be noted, however, that the Council spends nearly twice as much on aid to research as on the arts. The Council is a member of all consulting bodies brought together by the Department of External Affairs for periodic reviews of cultural and technical exchanges with other countries, including the Cultural Exchange Programme with European Countries mentioned above.

27. At a time when the boundaries between certain academic disciplines are blurring and when there is growing interest in interdisciplinary research, the Council's relationship with the N.R.C. becomes increasingly important. Informal consultation between the two Councils has enabled them generally to concert their activities in those disciplines that lie between their mandates -- such as psychology, archaeology, anthropology, geography. A formal tie is that the Director of the Canada Council is an Associate of the National Research Council.

28. The Council maintains ties with the National Museums of Canada, and the National Arts Centre through membership of its Director on their respective boards. The Canada Council is also present at all discussions which bring together the cultural organizations which report through the Secretary of State.

Programme Development

29. The Canada Council is the national agency for the development of freely initiated research in the social sciences and humanities. While a good deal of research is conducted by social scientists under contract to various government agencies, royal commissions and task forces, the Council is responsible for assisting general development of research in these disciplines. The Council now accounts for about 3/4 of the funds expended by the Federal Government in the social sciences and humanities.

However the amount applied by the Canada Council directly to research grants is barely equal to that expended by the Federal Government for mission-oriented university research in the social sciences. Statutory basis for this programme is of course the Canada Council Act, sections 8 to 13 of which are attached as Appendix E.

30. Popular belief to the contrary, there are more Canadian scholars in the social sciences and humanities than in the physical and life sciences combined. In 1967-68 the totals were 9,180 as opposed to 7,012.

31. The growth of Canada Council assistance to the social sciences and humanities in recent years can be viewed as a recovery operation. As recently as 1964-65, the Canada Council spent only \$1.4 million on its academic programme, a token amount in view of the expansion that had already taken place in the social sciences and humanities. By 1968-69 Council assistance in this field had risen to \$16.6 million, and this year it is expected to amount to \$19.4 million, but still support to the human sciences in Canada lags far behind that given the physical and life sciences. The Canada Council has now almost reached the level at which N.R.C. and M.R.C. were six years ago. These two agencies reached a combined level of \$86 million in 1968-69. (Appendix F shows the levels of Canada Council assistance over a six year period, with corresponding totals for the NRC and MRC).

32. Social scientists and humanists, long starved for research funds, are responding to the support offered by the Canada Council, as will be seen below. In the vital field of research training (Doctoral Fellowships), once the gap with the physical and life sciences has been closed, the Council's support should rise evenly in relation to the growth in graduate enrolment.

33. Most Canada Council support to the social sciences and humanities goes to assist doctoral candidates through the final stages of their training as researchers and to provide direct support to free research by established scholars. The Council also assists research communication through grants for the publication of journals and scholarly works, for the holding of and attendance at scholarly conferences and for exchanges. To a limited extent the Council helps build up research facilities through grants for specialized library collections. All of these programmes are designed to increase Canada's research potential in the human sciences and, seen from another side, to create conditions whereby Canadian universities will be able to attract and hold scholars of the first order.

34. Attached as appendices are tables answering some often-asked questions about the distribution of Canada Council programmes of assistance. They are:

Appendix G -- Amounts awarded in 1968-69 classified by academic discipline;

Appendix H --

Table 1.1 Doctoral Fellowships by province of permanent residence;

Table 1.2 Doctoral Fellowships by country of intended tenure and
by university of intended tenure in Canada;

Table 1.3 Doctoral Fellowships by discipline;

Table 2 Post-doctoral Fellowships by discipline;

Table 3.1 Leave Fellowships by university of affiliation;

Table 3.2 Leave Fellowships by discipline;

Table 4.1 Research Grants by university of affiliation;

Table 4.2 Research Grants by discipline;

Table 5 Library Research Collection Grants by university.

Programme Review and Revision

35. Means are now being developed of involving academic advisers more closely in assessing the results of Council-supported activity. This should lead to the involvement of scholars and their learned societies in field surveys of major research projects backed by the Council. They should also be involved in assessing the overall pattern of Council-supported activity in specific areas, identifying any weakness that may be found and suggesting ways of redressing any imbalance. The Council expects to undertake pilot projects of this kind during the current year.

36. The Council has also developed its internal system of administration and record-keeping to keep pace with the rapid expansion of the academic programme. A complete overhaul of administrative methods was begun two years ago, with the assistance of the management-consultant firm Urwick-Currie. One result of this is that it is now possible to make a more analytical review of Council-supported activity, a necessary forerunner to the programme assessment and evaluation process outlined above.

Developing Tools for More Effective Performance

37. Apart from the vexed question of financial resources, common to all grant-giving bodies, the Council has had to face the problems attendant on entering a vast, previously unknown area of public subsidy.

38. The Dominion Bureau of Statistics provides virtually no information on research expenditures in the social sciences and humanities, which it does for natural sciences, and there are many other gaps in the statistical information provided by the Bureau on academic enrolment and facilities.

39. The Council cannot forecast its future needs until it has full information on the support coming from other sources, public and private, domestic and foreign, for both contractual and free research. At the moment

there is no stipend for the principal investigator attached to grants for free research, while there are stipends in contractual research and in grants from United States sources for free research. The Council must have full information on such stipends and other factors. It must know what its grants are competing with if it is to make free research attractive to Canadian scholars. The Council, in partnership with the A.U.C.C. and the C.A.U.T., was about to launch a survey on this question in 1966-67 when it joined forces with the Science Council of Canada in a broader review of the funding of university research conducted under the direction of Dr. Macdonald, former President of the University of British Columbia. Since the survey, now completed, did not in fact provide the necessary information the Council must now look for some other solution.

40. Along with the build-up of information needed to administer its programmes, the Council has had to be increasingly concerned with its retrieval. For example, the Council has always relied heavily on the opinions of scholarly assessors for research grants, as will be seen below. As more applications come in and more assessors are added to an already extensive list, matching the two becomes a more complex and time-consuming process. The Council has undertaken a study of a computer service to assist in this and other things. It will help in extending the list of assessors and in matching them more exactly with projects under consideration.

41. The Council is now faced with the need for an inventory of research in the social sciences and humanities. For obvious reasons, this must include all Canadian research activity in these disciplines,

as well as that supported by the Council, and will require a computer service. It is a necessary step in the process of programme review and revision described above.

42. The Council recognizes the large role to be played by the learned societies in the growth of research in the social sciences and humanities. They have received and are receiving Council assistance to help them perform more effectively, as described later in the brief under "Research Communication". It will nonetheless be some time before they can give the leadership expected from them, particularly in helping assess the Council's programme of assistance.

Research Training

43. Well over half of Council support to the social sciences and humanities goes to assist doctoral candidates through the final stage of their training for a career of research and teaching. (Complete figures are in Appendix F). In 1968-69, \$9.3 million was spent to award 2,155 Doctoral Fellowships, and an estimated \$11.2 million will be spent in the current year for 2,640 awards. Aimed at Canadians and landed immigrants to Canada enrolled in universities here and abroad, the programme of Doctoral Fellowships has developed in response to both an increased proportional demand from the doctoral candidates and an explosion in their numbers. For example, in 1970-71 there are expected to be 6,480 students eligible for Canada Council assistance. The corresponding enrolment figure in the physical and life sciences is expected to be 6,100. (Appendix I shows past and projected growth of the "universe" of doctoral candidates in relation to Council assistance).

44. The dramatic increase in Doctoral Fellowship applications shown in Appendix I can be attributed in part to new rates of support adopted in 1967-68; \$3,500 as the basic grant, rising to \$4,500 in the concluding stages of doctoral studies and with an added \$1,000 at each stage for those who had given up the security of regular employment to re-enter graduate studies. The higher rates and extended tenure make the Council's Fellowships competitive with the more attractive foreign programmes, which used to attract so many of the best Canadian students. The rates were adopted to help correct a situation in which, at last count, only 38% of social sciences and humanities teaching staff in Canadian universities held doctoral degrees, compared to 57% in the natural sciences. (A factor is that on the average it takes two years longer for students in the former disciplines to complete their doctoral programmes). As mentioned above, provision is made in the rates to keep those who have completed residence requirements working at their theses, and to bring back to their doctoral work those who have set it aside for teaching or research posts. The Council was a year ahead of American foundations in adopting this policy.

45. The Canada Council has always extended its Doctoral Fellowships to Canadians who choose to complete their studies either abroad or in this country. The theory that this would maintain their ties to this country has been confirmed by a Council study (a summary is attached as Appendix J) which shows an average repatriation rate of 80% for those who did in fact choose to study at a foreign university. The fear that this policy of the Council might slow down the growth of graduate studies in Canada has proven groundless.

46. There has also been a sharp upward turn in the numbers electing to do their doctoral work in Canada. Among those awarded Fellowships this year, 1,006 intend to study in Canadian universities, 46.7% of the total. Three years ago there were 329, or 29.8%. Among those receiving a Fellowship for the first time this year (as opposed to a renewal), the percentage choosing to study in Canada is 50.2%.

47. Behind these figures is the phenomenal growth of Canadian graduate schools in the social sciences and humanities, now training 16,000 full-time students, and expected to have an enrolment of 31,000 by 1973-74.

Research Work

48. Aid to established scholars is expected to rise from last year's \$4.2 million to an estimated \$5.4 million during 1969-70. Three-quarters of this amount will be given in Research Grants to support the investigations of an estimated 1,030 social scientists and humanists; and 170 scholars will be awarded Leave Fellowships to assist them to free themselves for a year of research or study.

49. The number of career scholars who received Council assistance in 1968-69 represented 9.5% of the 10,470 social scientists and humanists on the faculties of Canadian universities, while requests for assistance during the year came from 12.1% of the universe. This year requests for assistance are expected from 13.5% of the universe, and awards should reach 10%, pointing out the need for this programme to keep its momentum in pace with the growing research activity in the social sciences and humanities in Canada.

50. Under the programme of Izaak Walton Killam Awards, administered by the Council on behalf of the Killam Scholarship Committee, a total of \$680,000 is budgeted this year for awards to scholars of exceptional ability engaged in research of far-reaching significance, either in the social sciences or humanities. This programme is made possible by a \$17 million bequest of the late Dorothy J. Killam (Mrs. Izaak Walton Killam).

51. With the growth of the research grants programme the Council has shown more and more concern with the processes of adjudication, and especially with the sources and quality of the informed opinion available. Judgment rests upon not only a final review by an academic panel, broadly representative of the social sciences and humanities, but also upon prior detailed assessment by specialists. (The process is shown in Chart 1 of Appendix C). Leading scholars abroad are sought for advice almost as much as experts at home, to help keep the Council's programme of assistance in line with the international standards of scholarship. A welcome by-product of the system is that the comments of an assessor are often passed on to the applicant and prove useful to him in organizing his research plan.

Research Communication

52. Canada Council support to research communication in the social sciences and humanities goes to individual scholars, to universities and to learned societies. Among present forms of aid are:

- grants both for the large annual meetings of learned societies and for ad hoc meetings of specialists in key research areas where effective national or international coordination can be achieved;

- grants to assist Canadian universities to bring in outstanding specialists as visiting scholars;

-- grants to enable Canadian scholars to take part in international learned conferences devoted to the discussion of current research;

-- block grants to the Social Science and Humanities Research Councils to assist publication of research works by Canadian scholars;

-- grants to enable learned societies to launch and maintain specialized journals of international caliber.

53. A recently completed study, backed by the Council, dealt with the feasibility of a common secretariat for the learned societies. In addition, discussions have been initiated with representatives of the Social Science and Humanities Research Councils of Canada and of the associations representing the various disciplines, to redefine their relation to the development of research in the light of the rapid growth of the Canadian academic community.

Research Facilities

54. While the shortage of library resources is perhaps the most urgent problem of Canadian researchers it is becoming evident that they are also hampered by the inadequacy of other research tools and services as well. Increasingly the Council is drawn towards the support of such things as research inventories, data banking systems and survey research facilities. First steps in this direction have been taken during the past year through grants to the Social Science Research Council of Canada, several learned societies and individual scholars for studies of the research facilities available and the needs to be met.

55. The Council is very conscious of the need to build up library research collections. A Council-supported survey conducted by the AUCC recommends that present university collections be at least doubled. It is estimated that this would cost \$100 million for acquisitions alone, over the current level of purchases. To house and staff these expanded collections would require further expenditures of roughly \$300 million.

56. The Canada Council can play only a limited role in meeting this total requirement. The level of our aid in 1967-68 and 1968-69 has been limited to \$1 million a year for purchases of library research resources for the use of departments in the social sciences and humanities where there is an active programme of advanced research, including graduate studies. Although our budget for 1969-70 shows only \$65,000 for this programme, the Council will be able to maintain its level of aid at \$1 million a year. This is made possible by a budget accounting procedure.

APPENDIX AMEMBERS OF THE CANADA COUNCIL

Mr. Jean Martineau, Q.C. (Montreal): Chairman of the Canada Council. Born in Montreal, 1895; son of the late Hon. P.G. Martineau. Education: St. Hyacinthe Seminary, St. Jean College and St. Laurent College; LL.L. University of Montreal; Hon. LL.D. Faculty of Law of the University of Montreal. Hon. LL.D. Faculty of Law of Laval University. Called to the Bar of the Province of Quebec in July 1919; Queen's Counsel in October, 1929. Bâtonnier of the Bar of Montreal and the Bar of the Province of Quebec, 1953-54. Senior partner in the law firm of Martineau, Walker, Allison, Beaulieu, Tetley and Phelan. Director of the Royal Trust Company, Monsanto Canada Limited, Chateau-Gai Wines Limited and a director of the Montreal Museum of Fine Arts. Appointed Chairman of the Canada Council in 1964.

Dr. John Francis Leddy (Windsor): Vice-Chairman of the Canada Council. President and Vice-Chancellor of the University of Windsor. Born in 1911 in Ottawa, but moved to Saskatoon at an early age. B.A. and M.A., University of Saskatchewan, post-graduate studies in classics at the University of Chicago, Rhodes Scholar at Exeter College, Oxford, (B.Litt. and D.Phil.). Joined the Department of Classics, University of Saskatchewan, in 1936, became head of the Department in 1946, dean of Arts and Science in 1949, and vice-president (academic) in 1961. Appointed president of the University of Windsor in 1964. Has held positions of leadership in a wide variety of public and educational societies in Canada, including chairmanship of the Educational Council of Saskatchewan, the Humanities Research Council of Canada, the Canadian Catholic Historical Association, the Canadian National Commission for UNESCO, Canadian University Service Overseas, World University Service of Canada. Is currently international vice-president of World University Service. Has travelled widely around the world and has been delegated to many international conferences and meetings. Author of a large number of special articles in the fields of university education, the ancient classics, and the history of ideas. Has received many honors, including honorary degrees from several universities, the Human Relations Award of the Canadian Council of Christians and Jews; the Cardinal Newman Award of the Canadian Federation of Newman Clubs, and several papal awards.

Professor Murray Adaskin (Saskatoon): Composer-in-Residence and Professor of Music at the University of Saskatchewan. Born in Toronto in 1906. Educated in Toronto. Studied violin in Toronto with Kathleen Parlow and in Paris with the late Marcel Chaillay. Studied composition with Canadian composer John Weinzwieg, French composer Darius Milhaud and Charles Jones. After working with the Canadian Broadcasting Corporation, was appointed head of the Department of Music, Saskatoon Campus, in 1952. In November 1966, relinquished this post to be appointed composer-in-residence, one of the first appointments of its kind in a Canadian University. Has been guest speaker on several occasions and has adjudicated national composition contests. Organized and directed the first Composer-Exhibition Series in Saskatoon (1967). Is a charter member of the Canadian League of Composers, a member of the Canadian Association of Publishers, Authors, and Composers, and a member of the Saskatoon Art Centre Board. Has composed over 30 major works. His compositions have been performed and broadcast in many countries, and several of them have been recorded commercially.

Rev. Jean Adrien Arsenault (Charlottetown): Assistant Professor of French and fine arts at St. Dunstan's University, Charlottetown. Born June 23, 1925, at Mount Carmel, P.E.I. Attended public schools in P.E.I. and later Le Petit Séminaire de Québec where, in 1947, he obtained a B.A. (Laval). Studied theology at Holy Heart Seminary, Halifax, and philosophy at the Sorbonne on a French government scholarship. M.A. in Drama, Catholic University of America, Washington, D.C. Studied painting at the School of Fine Arts, Quebec City. Active in dramatics as a director and playwright.

Mr. Alex Colville (Sackville, N.B.): Artist. Born in Toronto in 1920. Educated in Nova Scotia. Studied fine arts at Mount Allison University. Taught at Mount Allison University from 1946 to 1960. An artist of international repute, his work is represented in the majority of Canadian

... Appendix A

public collections, in the Museum of Modern Art, New York, and in many private collections in Canada and in the United States. As official war artist, he painted for the Army and Navy in the Mediterranean and in northern Europe. He is the designer of the Wild Life Series of special coins issued for the Centennial year.

Dr. J.A. Corry (Montreal): Political scientist, formerly principal of Queen's University. Born in Millbank, Ontario, in 1899. Graduated in law from the University of Saskatchewan and was a Rhodes Scholar from Saskatchewan at Oxford University. He was called to the Bar of Saskatchewan in 1930. Formerly a Professor of Law at Saskatchewan University and a former Hardy Professor of Political Science at Queen's University. Was vice-principal of Queen's University from 1951 to 1961, then principal until 1968. Is now on the staff of the Law faculty of McGill University. He is well known throughout the English-speaking world for his text-book DEMOCRATIC GOVERNMENT AND POLITICS (1946), and is the author of several other books: ELEMENTS OF DEMOCRATIC GOVERNMENT (1947); LAW AND POLICY (1959); and THE CHANGING CONDITIONS OF POLITICS (1963). From time to time he has been called upon to advise the federal government on Federal-Provincial relations and he was a contributor to the Rowell-Sirois commission. He has been member and chairman of the Social Science Research Council of Canada, and member of the C.B.C. Board of Governors. In 1957, he was mainly responsible for the launching of the Queen's Faculty of Law, and he was its acting dean for the first year. Has received honorary degrees from a number of universities and was named Companion to the Order of Canada in 1968.

Miss Andrée Desautels (Montreal): Musicologist, professor at the Montreal Conservatory. Studied piano, composition and music writing at the Quebec Conservatory of Music and art history at the University of Montreal. Was editor-in-chief of the Journal Musical Canadien for seven years and is well-known as a music critic with Montreal newspapers and on the CBC. Has been professor of music history and musicology at the Montreal Conservatory since 1949. As Assistant Commissioner of the Man and Music Pavilion at Expo '67, was responsible for much of the planning and organization of its program in co-operation with Les Jeunesses Musicales. Author of several publications on Canadian Music. Was founder and first chairman of the Association of Conservatory Professors of Quebec.

Mr. Louis A. Desrochers (Edmonton): Barrister. Born in Montreal in 1928, moved to Jasper, Alberta, at the age of 11. B.A. degree from the University of Ottawa. Received LL.B. from University of Alberta in 1953, and was called to Alberta Bar in the same year. Since then, has been director of CHRA radio station, Treasurer, Vice-President and President of the French Canadian Association of Alberta, Director and President of the Edmonton Family Service Bureau; member of the Board of Directors of Community Chest of Edmonton; member of the Northwest Territories Council; co-trustee of the Northwest Territories Flood Relief Fund; Member of the Advisory Board and Vice-Chairman of the Governing Board of the Misericordia Hospital; Provincial Treasurer of the Canadian Conference on Children. He is currently vice-chairman of the Board of Governors of the University of Alberta and Director of L'Assurance-Vie Desjardins.

Mrs. Miriam Barber Dorrance (Vancouver): Born in West Templeton, P.Q., in 1894. Graduated from the Faculty of Dentistry, University of Toronto, with the degree of D.D.S. in 1921. Practiced dentistry in Lethbridge for 3½ years and has lived in British Columbia since 1929. A member of the Advisory Board of the Women's Committee to the Vancouver Symphony Society and Honorary Treasurer and member of the Board of Shaughnessy Hospital Auxiliary, she has been active for many years in the Community Chest, Canadian Girl Guides, Canadian Red Cross, and the University Women's Club of Vancouver. She is the wife of Dr. Wallace J. Dorrance.

Dr. Henry D. Hicks (Halifax): President of Dalhousie University. Born in Bridgetown, N.S., 1915. Educated at Mount Allison University and Dalhousie University. Rhodes Scholar to Oxford University, England. Called to the Bar of Nova Scotia in 1941. Served in the Royal Canadian Artillery during World War II, and in 1945, was elected to the Legislature of Nova Scotia. Appointed Minister of Education in 1949, and later assumed the additional post of Provincial Secretary. Became Premier of Nova Scotia in September, 1954. Leader of the Opposition from 1956 until he resigned as Leader of the Liberal Party in Nova Scotia in 1960. Dean of Arts and Science at Dalhousie University in 1960. Vice-President of the university in 1961 and President in 1963. Has received honorary degrees from several Canadian universities. Appointed to Canada Council in 1963. Served as President of the Canadian National Commission for Unesco (1963-1967), and lead the Canadian delegation to the General Conference of Unesco in 1964 and 1966.

... Appendix A

Mr. Stuart Keate (Vancouver): Journalist, publisher of the Vancouver Sun. Born in Vancouver in 1913. Began newspaper work on the Ubysey, campus newspaper at the University of British Columbia, and on graduation in 1935 joined the staff of the Vancouver Daily Province as a sports writer.

From 1935 to 1942, worked for the Province and the Toronto Daily Star as a reporter, columnist and movie critic. In the fall of 1942, joined the RCNVR in the information department, and saw service on ships in both the Atlantic and Pacific theatres, retiring with the rank of lieutenant-commander.

At the end of the war, joined Time Inc. in New York as a writer on Canadian affairs. From 1947 to 1950, served as Montreal bureau chief for Time and Life, resigning in 1950 to return to the Pacific Coast as publisher of the Victoria Daily Times.

In 1959, when the Max Bell papers joined with the Siftons to form the FP Publications group, Mr. Keate was named a director of the parent company.

In May, 1964, he was appointed publisher of the Vancouver Sun, Canada's second largest daily, and named director of Sun Publishing Co. Ltd. and Pacific Press Limited.

In the course of his career, he has served as president of the Canadian Daily Newspaper Publishers Association, President of The Canadian Press (1965-66) and as a member of the Senate and Board of Governors of the University of British Columbia. He has contributed articles to Maclean's, Saturday Night, the Reader's Digest, N.Y. Times Book review, and many other national publications and has received the National Press Club award for outstanding contributions to journalism. He has also been active in the affairs of the International Press Institute and Inter-American Press Association.

Mr. Napoléon LeBlanc (Quebec City): Vice-rector of Laval University since 1968. Was educated at Laval University, where he received the degrees of Bachelor in Agronomy and Master of Social Sciences. Travelled in Canada and in the U.S. on a Carnegie fellowship in 1953 to study the contribution of the universities to adult education. Professor in the Faculty of Social Sciences of Laval University, 1960, dean of the Faculty in 1961, and vice-rector of the University in 1968. Has been active in the field of adult education and was for six years co-director of the bilingual camp on adult education and intercultural relations held annually at Laquemac... Has written many papers on adult and labour education. A former president of the National University - Labour Education Committee, the Commission on Public Libraries of Quebec, L'Institut Canadien d'Education des Adultes, the Catholic Committee of the Quebec Superior Council on Education, World University Service of Canada and L'Association Canadienne-Française pour l'Avancement des Sciences. Currently president of the Canadian Commission for Unesco.

Mr. Douglas V. LePan (Toronto): Principal of University College, University of Toronto, since 1964. Born in Toronto in 1914. Educated at the University of Toronto and Oxford University. Served in the Second World War and was education adviser to General A.G. McNaughton in 1942-43. Has held a number of appointments in the Department of External Affairs, including those of Minister Counsellor in Washington (1951-55) and Assistant Under-Secretary of State for External Affairs (1958-59). Was seconded in 1955-58 to serve as Secretary and Director of Research of the Royal Commission on Canada's Economic prospect (Gordon Commission). From 1959 to 1964, was Professor of English Literature at Queen's University. A well-known writer, he has twice won a Governor General's Literary Award, in 1953 for poetry in English and in 1964 for fiction in English.

Dr. Léon Lortie (Montreal): Scientist and scholar, former secretary general of the University of Montreal. Born in Montreal in 1902. Educated at the University of Montreal, University of Paris (Docteur ès sciences physiques) and Cornell University. Professor of chemistry at the University of Montreal for many years, at the same time teaching chemistry, physics and scientific history in various Montreal colleges.

... Appendix A

Visiting lecturer for three years at McGill University. Appointed director of extension courses at the University of Montreal in 1952, assistant to the Rector and secretary general of the University in 1962. Was a pioneer in the popular teaching of science and wrote many articles and papers on science subjects. Has also been active in public affairs and was the first Chairman of the Canadian Institute of Public Affairs. Former President of the Chemical Institute of Canada, the Association canadienne-française pour l'Avancement des Sciences and of a number of other organizations. Has been awarded honorary degrees by several universities. Actively interested in literature and the arts. President of the Greater Montreal Council of the Arts since 1957.

Dr. C.J. Mackenzie (Ottawa): Former President of the National Research Council and of Atomic Energy of Canada Ltd. Born in St. Stephen, N.B., in 1888. A graduate of Dalhousie University and Harvard. Overseas service 1916-18 with C.E.F., awarded Military Cross. Returned to University of Saskatchewan in 1918 as Professor of Civil Engineering. In 1921, appointed Dean of the Engineering College at Saskatoon. Appointed to the Advisory Council of the National Research Council in 1935, made Acting President in 1939 and President in 1944. Resigned in 1952 to become President of the newly formed Atomic Energy of Canada Ltd. Retired in 1953. Has held many public offices and has received honorary degrees from many universities. Is currently Chancellor of Carleton University and a member of the Advisory Council, National Research Council. In May 1968, received the \$50,000 Royal Bank Award for outstanding contributions to "human welfare and common good". Often called "the dean of Canada's Scientists".

Mr. G. Byron March (St. John's, Nfld.): Educator. Born in Old Perlican, Nfld., in 1921. A graduate of Memorial University, Acadia, and Columbia University, New York (M.A. in Educational administration). Vice-Principal, then Principal of Curtis Academy in St. Johns, and later Principal of Prince of Wales Collegiate. Since 1963, has been Director of Education of St. John's United Church School Board. Has been active in the educational life of Newfoundland, serving as an executive

of the Newfoundland Teacher's Association and as a member of the Royal Commission on Education and Youth.

Mrs. Pauline Mills McGibbon (Toronto): Born in Sarnia, Ontario. A graduate of the University of Toronto. Married to Donald W. McGibbon. Has been active in community affairs, education and the arts, serving on the executive boards of many organizations. Has been President of the University of Toronto Alumni Association, President of the Dominion Drama Festival, first President of the Children's Film Library of Canada and Vice-President of the Canadian Association for Adult Education. Is currently chairman of the Board of Governors of the National Theatre School of Canada, first vice-president of the Canadian Conference of the Arts, first vice-president of the board of governors of the Women's College Hospital, Toronto, and a member on the Board of Governor of the Elliott Lake Centre for Continuing Education. Has received several honours including the Canadian Drama Award for Outstanding Services to Theatre (1957), the Medal of Service of the Order of Canada (1967) and an Honorary LL.D. from the University of Alberta (1967) in recognition of the contribution of Canadian women to Canada in recent years.

Miss Kathleen M. Richardson (Winnipeg): Born in Winnipeg, Manitoba. Has been actively associated with a number of cultural organizations in Winnipeg, both musical and theatrical, and is widely known for her work with the Royal Winnipeg Ballet, having served as its President for four years. In recognition of her services with this Organization, she has been named its honorary president.

She has also been Secretary of the University Chamber Music Society; Board Member of the Junior League of Winnipeg; Chairman of the Royal Winnipeg Ballet School and has served on the Board of the Winnipeg Symphony Orchestra. She is a member of the National Executive Council of Pan-American Games and a director of James Richardson and Sons Ltd.

... Appendix A

Dr. Aileen D. Ross (Montreal): Sociologist, professor at McGill University. Born in Montreal in 1902. Educated at the University of London (B.Sc.) and at the University of Chicago (M.A. and Ph.D.). Curriculum advisor at MacDonald College, P.Q., from 1940 to 1942. After serving for three years as instructor in the Department of Economics and Political Science at the University of Toronto, joined the staff of McGill University in 1945 and is now full professor in the Department of Sociology and Anthropology. Has held executive positions in such organizations as the Canadian Institute of International Affairs and the Canadian Citizenship Council, and served on the Canadian Delegation to the 1958 Unesco Conference. Has published many articles and papers in learned journals and is the author of two books: *The Hindu Family in its Urban Setting*, and *Becoming a Nurse*. She is currently president of the Shastri-Indo-Canadian Institute.

Dr. David W. Slater (Kingston): Professor of Economics and Dean of the School of Graduate Studies, Queen's University. Born in Winnipeg in 1921. Educated at the University of Manitoba (B. Comm.), Queen's University (B.A., Honours in Economics) and the University of Chicago (M.A. and Ph.D.). Served in the Canadian Army in World War II. After lecturing at Queen's University and Stanford University, joined the staff of Queen's University in 1952 and was promoted to professor of economics in 1962. Has been Dean of the School of Graduate Studies since June 1968. Served on the staff of the Royal Commission on Canada's Economic Prospects (Gordon Commission), in 1955-56. Has published many articles on economics and has served on committees studying education, economics, university affairs and the social sciences. Is currently a member of the Committee of University Affairs and editor of the *Canadian Banker's Magazine*.

APPENDIX BTHE CANADA COUNCILMEMBERS OF ACADEMIC PANEL 1968-69

Dr. Edmund Berry,
Department of Classics,
University of Manitoba,
Winnipeg, Manitoba.

Professor David Braybrooke,
Department of Philosophy & Politics,
Dalhousie University,
Halifax, Nova Scotia.

Dr. Jacques Brazeau, (Chairman)
Département de sociologie,
Université de Montréal,
Montréal, Québec.

Professeur Paul André Comeau,
Département des Sciences politiques,
Faculté des Sciences sociales,
Université d'Ottawa,
Ottawa 2, Ontario.

Professeur Vianney Décarie,
Département de philosophie,
Université de Montréal,
Montréal, Québec.

Professor E.J.H. Greene, (Vice Chairman)
Associate Dean of Arts,
University of Alberta,
Edmonton, Alberta.

Professor J.E. Hodgetts,
Principal,
Victoria College,
Toronto 5, Ontario.

Professeur W.F. Mackey,
Département de linguistique,
Faculté des lettres,
Université Laval,
Québec 10e, Québec.

Révérant Père Bernard Mailhiot, O.P.,
Institut de psychologie,
Université de Montréal,
Montréal, Québec.

Professor A.M. Moore,
Department of Economics,
University of British Columbia,
Vancouver 8, B.C.

Professor H. Blair Neatby,
12 Allan Place,
Ottawa 1, Ontario.

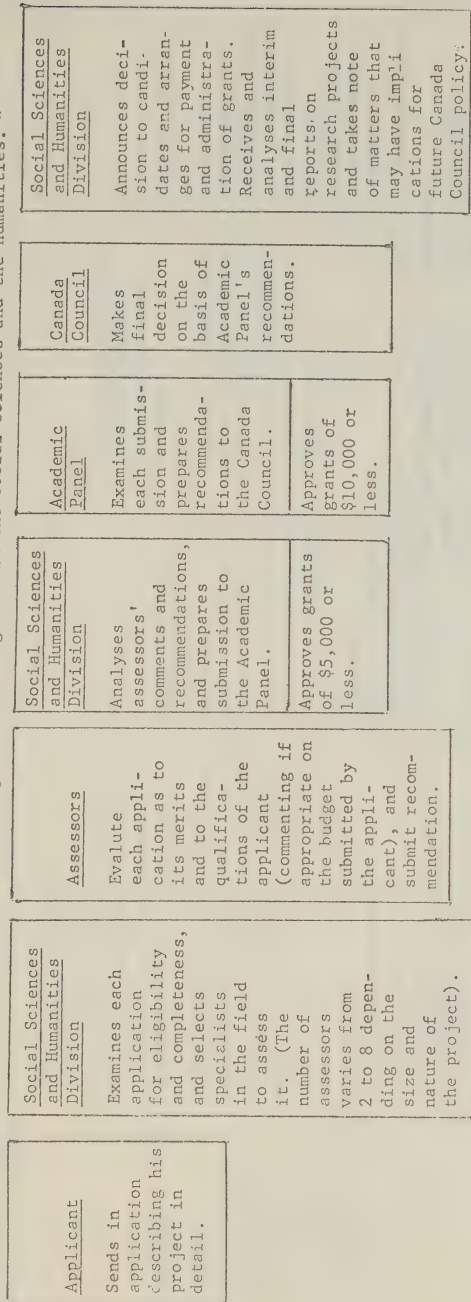
Dr. W.C. Desmond Pacey,
Dean of Graduate Studies,
University of New Brunswick,
Fredericton, N.B.

Professor A.E. Safarian,
Department of Political Economy,
University of Toronto,
Toronto 5, Ontario.

Monsieur Marcel Trudel,
Département d'histoire,
Université d'Ottawa,
Ottawa 2, Ontario.

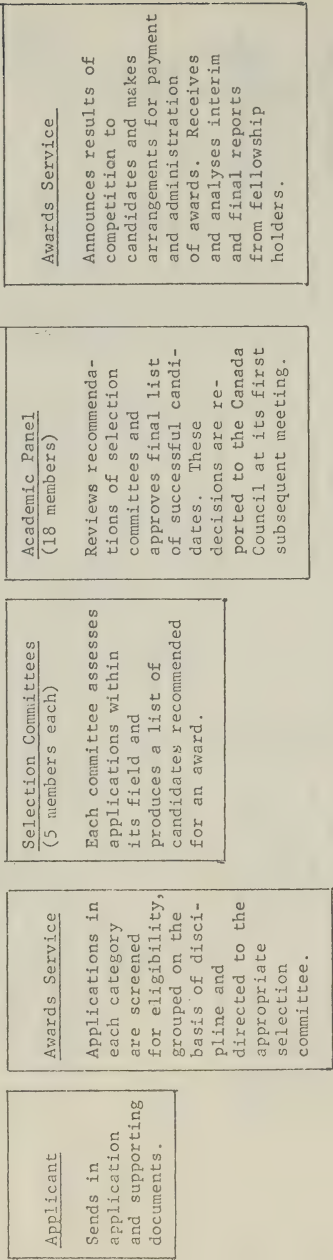
Professor F.G. Vallee,
Chairman,
Department of Sociology,
Carleton University,
Ottawa, Ontario.

Appendix C, Chart 1 - Procedure for the awarding of research grants in the social sciences and the humanities. *



APPENDIX C

Appendix C, Chart 2 - Adjudication process for doctoral, leave and post-doctoral fellowships in the social sciences and humanities.

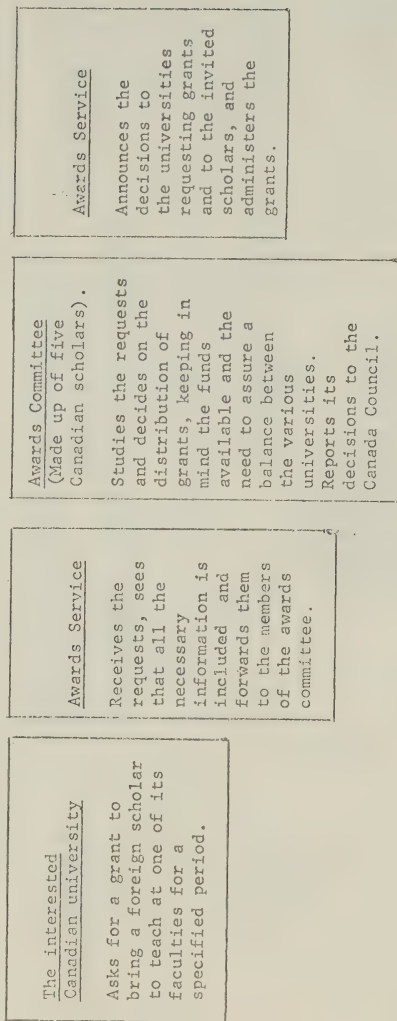


Appendix D, Chart 1 - Cultural Exchange - Procedure for the awarding of fellowships to citizens of foreign countries.

<p><u>Applicant</u></p> <p>Sends in application to the appropriate government department of his country or to the Canadian consulate or embassy.</p>	<p><u>Selection Committee</u> (In each of the participating countries made up of representatives from the universities, the government and the Canadian embassy).</p> <p>Makes a preliminary selection of candidates, forwards the list to the Canadian embassy, which forwards it to Ottawa.</p>	<p><u>Awards Service</u></p> <p>Groups the applications by area of interest and sends them to one or other of the two selection committees (one for the social sciences and humanities and the other for the physical and life sciences.)</p>	<p><u>Selection Committees</u> (Each made up of six Canadian scholars).</p> <p>Study applications, select award-winners, and notify the Council's Academic Committee of their decisions.</p>	<p><u>Awards Service</u></p> <p>Arranges payment and administration of fellowships and receives progress reports from the fellowship-holders.</p>
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APPENDIX D

Appendix D, Chart 2 - Cultural Exchange - Procedure for the awarding of grants for visiting lecturers.



APPENDIX E

OBJECTS AND POWERS OF THE COUNCIL.

Objects and
Powers.

8. (1) The objects of the Council are to foster and promote the study and enjoyment of, and the production of works in, the arts, humanities and social sciences, and, in particular, but without limiting the generality of the foregoing, the Council may, in furtherance of its objects,

(a) assist, co-operate with and enlist the aid of organizations, the objects of which are similar to any of the objects of the Council;

(b) provide, through appropriate organizations or otherwise, for grants, scholarships or loans to persons in Canada for study or research in the arts, humanities or social sciences in Canada or elsewhere or to persons in other countries for study or research in such fields in Canada;

(c) make awards to persons in Canada for outstanding accomplishment in the arts, humanities or social sciences;

(d) arrange for and sponsor exhibitions, performances and publications of works in the arts, humanities or social sciences;

(e) exchange with other countries or organizations or persons therein knowledge and information respecting the arts, humanities and social sciences; and

(f) arrange for representation and interpretation of Canadian arts, humanities and social sciences in other countries.

(2) The Governor in Council may assign to the Council such functions and duties in relation to the United Nations Educational, Scientific and Cultural Organization as he considers desirable.

Council to
act in
relation to
U.N.E.S.C.O.

9. The Council may, in furtherance of its objects, make grants to universities and similar institutions of higher learning by way of capital assistance in respect of building construction projects.

University
grants.

10. The Council may make by-laws regulating its proceedings and generally for the conduct and management of its activities, including the appointment of honorary officers and of advisory committees.

By-laws.

11. The Council shall meet at least three times a year in the City of Ottawa on such days as are fixed by the Council and at such other times and places as the Council deems necessary.

Meetings of
Council.

12. The Director and Associate Director and the employees of the Council shall be deemed to be employed in the Public Service for the purposes of the *Public Service Superannuation Act*, and the Council shall be deemed to be a Public Service Corporation for the purposes of section 23 of that Act.

Pension
fund.

13. The Council is not an agent of Her Majesty, and, except as provided in section 12, the members and employees and the Director and Associate Director of the Council are not part of the public service.

Not agent of
Her Majesty.

SOCIAL SCIENCES AND HUMANITIES PROGRAMME

	A c t u a l					Estimated
	1964-65	1965-66	1966-67	1967-68	1968-69 [*]	1969-70
	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)
<u>Research training -</u>						
Doctoral fellowships	695	1,181	2,931	6,477	9,296	11,220
<u>Research work -</u>						
Post-doctoral fellowships	-	-	-	159	280	480
Leave fellowships	177	305	617	877	1,260	1,260
Research grants	203	412	983	2,102 ^{**}	2,900 ^{***}	4,130
Killam grants	-	-	-	-	493	680
<u>Research communication -</u>						
Publications grants	94	138	293	243	303	350
Meetings and Exchanges	59	150	147	250	414	450
<u>Research facilities -</u>						
Research Collections	45	565	500	1,003	1,000	65
<u>Special Awards & Grants</u>	54	89	83	97	157	100
<u>Adjudicators' fees and expenses</u>	7	32	59	116	150	220
<u>Aid to foreign students and scholars</u>	69	245	225	260	343	407
Total SS & H Programme	1,403	3,117	5,838	11,584	16,596	19,362
Total Canada Council Budget less University Capital Grants Fund	3,511	7,556	11,385	20,442	28,839	32,223
Combined NRC - MRC budget for university support	26,050	33,570	52,750	66,105	86,263	95,861

* Subject to a few minor revisions.

** Of which some \$740,000 was spent to cover the cost of 437 research assistants.

*** Of which about \$1 million was spent to cover the cost of 597 research assistants.

APPENDIX G

A DISTRIBUTION BY DISCIPLINE OF AMOUNTS AWARDED UNDER THE
RESEARCH TRAINING AND RESEARCH WORK PROGRAMMES
1968/69

Discipline	Research Training	Research Work				Totals
	Doctoral Fellow- ships*	Post- doctoral Fellow- ships*	Leave Fellow- ships*	Research Grants	Killam Awards	
				dollars		
ANTHROPOLOGY	263,135	8,000	37,059	163,969	79,000	551,163
ARCHAEOLOGY	56,078	-	7,412	43,286	-	106,776
DEMOGRAPHY	17,255	-	-	11,645	-	28,900
ECONOMICS	737,641	32,000	88,941	263,282	58,926	1,180,790
FINE ARTS						
Architecture	21,569	-	7,412	9,836	12,000	50,817
Art History	77,646	-	14,824	49,161	-	141,631
Music	150,979	8,000	14,824	55,450	-	229,253
GEOGRAPHY	267,449	8,000	66,706	161,657	-	503,812
HISTORY	1,298,420	48,000	207,529	368,837	-	1,922,786
INDUSTRIAL RELATIONS	51,764	-	-	-	-	51,764
LANGUAGE & LITERATURE						
Asian	17,255	-	7,412	40,844	-	65,511
Classics	202,743	32,000	22,235	45,759	-	302,737
English	1,371,753	32,000	244,588	222,923	-	1,871,264
French	655,681	8,000	81,529	91,736	-	836,946
German	172,548	-	14,824	21,905	-	209,277
Italian	25,882	-	7,412	11,300	-	44,594
Slavic (Russian)	77,646	-	-	24,859	-	102,505
Spanish	120,783	-	7,412	37,374	-	165,569
LAW	215,684	-	29,647	171,882	-	417,213
LINGUISTICS	297,645	24,000	22,235	212,986	-	556,866
MATHEMATICS	276,077	-	37,059	4,355	-	317,491
PHILOSOPHY	923,129	24,000	148,235	46,319	-	1,141,683
POLITICAL SCIENCE	772,150	16,000	66,706	209,289	208,572	1,272,717
SOCIAL PSYCHOLOGY	474,506	32,000	51,882	243,300	-	801,688

See notes on next page.

Discipline	Research Training	Research Work				Totals
	Doctoral Fellow- ships*	Post- doctoral Fellow- ships*	Leave Fellow- ships*	Research Grants	Killam Awards	
	dollars					
SOCIOLOGY	750,582	8,000	74,117	378,370	20,610	1,231,679
OTHER**	-	-	-	13,234	74,535	87,769
<u>TOTAL</u>	<u>9,296,000</u>	<u>280,000</u>	<u>1,260,000</u>	<u>2,903,558</u>	<u>453,643</u> ^{***}	<u>14,193,201</u>

- Notes:
- * An average value has been used for each fellowship.
 - ** OTHER represents primarily grants of an interdisciplinary nature.
 - *** For purposes of comparison with the total cost of this programme which is shown in Appendix F, an amount of \$39,357 should be added to cover administrative expenses.

APPENDIX H

Table 1.1

DOCTORAL FELLOWSHIPS BY PROVINCE

OF PERMANENT RESIDENCE

1965/66 - 1968/69 (Fiscal Year)

Permanent Residence	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
	number							
TERRITORIES	-	-	1	1	2	2	4	2
BRITISH COLUMBIA	122	60	153	98	237	159	381	257
PRAIRIES:	180							
Alberta	-	23	106	75	186	113	300	171
Saskatchewan	-	12	54	38	100	63	117	75
Manitoba	-	24	97	54	125	76	133	72
ONTARIO	393	169	572	387	1084	674	1536	898
QUEBEC	297	126	362	244	610	375	942	582
ATLANTIC	63							
New Brunswick	-	5	40	21	52	31	56	28
Nova Scotia	-	11	34	22	81	47	95	44
Prince Edward Island	-		2	1	5	2	12	7
Newfoundland	-	1	11	8	22	12	27	19
TOTAL	<u>1055</u>	<u>431</u>	<u>1432</u>	<u>949</u>	<u>2504</u>	<u>1554</u>	<u>3603</u>	<u>2155</u>

Notes: Fellowships are listed under the fiscal year in which applications and awards were made although they were held during the following academic year.

Figures on awards relate to those originally offered by the Canada Council and do not take into account awards subsequently declined and re-offered.

For 1965/66 regional totals only are available for applications received from the Prairies and the Atlantic provinces.

Table 1.2 DOCTORAL FELLOWSHIPS BY COUNTRY OF INTENDED
TENURE AND BY UNIVERSITY OF INTENDED TENURE FOR CANADA
1965/66 - 1968/69 (Fiscal Year)

Intended Destination	1965/66	1966/67	1967/68	1968/69
	number			
CANADA:				
BRITISH COLUMBIA				
British Columbia	14	20	50	108
Simon Fraser	-	1	4	11
PRAIRIES				
Alberta	5	24	39	60
Calgary	-	5	6	22
Manitoba	3	4	7	10
Saskatchewan	1	-	4	2
ONTARIO				
Carleton	1	3	6	4
Guelph	-	-	1	1
McMaster	-	1	16	23
Ottawa	3	9	21	28
Queen's	6	24	57	78
Toronto	56	130	231	348
Waterloo	-	5	14	21
Western Ontario	6	17	38	46
York	-	-	6	13
QUEBEC				
Laval	13	27	27	35
McGill	10	25	51	96
Montreal	9	29	42	84
ATLANTIC				
Dalhousie	-	-	5	5
New Brunswick	-	5	6	3
UNSPECIFIED	1	-	4	8
AT TIME OF APPLICATION				
TOTAL, CANADA	128	329	635	1006

See notes on next page.

... Appendix H

Table 1.2 (Cont'd)

Intended Destination	1965/66	1966/67	1967/68	1968/69
	number			
<u>OUTSIDE CANADA:</u>				
UNITED STATES	163	321	448	550
UNITED KINGDOM	70	163	251	317
FRANCE	51	97	163	201
OTHER COUNTRIES	17	39	57	64
UNSPECIFIED	-	-	-	17
AT TIME OF APPLICATION				
<u>TOTAL, OUTSIDE CANADA</u>	301	620	919	1149
<u>GRAND TOTAL</u>	<u>429</u>	<u>949</u>	<u>1554</u>	<u>2155</u>

Notes: Fellowships are listed under the fiscal year in which awards were made although they were held during the following academic year.

Figures relate to the original awards offered by the Canada Council and do not take into account awards subsequently declined and re-offered.

The intended destination shown here is the first choice given by a candidate at the time of his application. It may differ from the university or country actually attended.

Table 1.3 DOCTORAL FELLOWSHIPS BY DISCIPLINE
1965/66 - 1968/69 (Fiscal Year)

Discipline	1965/66		1966/67		1967/68		1968/69	
	Applica-tions	Awards	Applica-tions	Awards	Applica-tions	Awards	Applica-tions	Awards
	number							
<u>ANTHROPOLOGY</u>	-	-	40	30	56	48	95	61
<u>ARCHAEOLOGY</u>	-	-	8	4	10	7	25	13
<u>DEMOGRAPHY</u>	-	-	11	4	11	8	4	4
<u>ECONOMICS</u>	134	52	172	117	287	175	286	171
<u>FINE ARTS</u>								
Architecture	10	3	3	2	9	8	10	5
Art History	16	7	24	18	36	22	29	18
Music	19	9	19	14	42	23	61	35
<u>GEOGRAPHY</u>	-	-	47	28	55	35	96	62
<u>HISTORY</u>	164	69	201	132	370	230	475	301
<u>INDUSTRIAL RELATIONS</u>	-	-	6	4	8	2	22	12
<u>LANGUAGE AND LITERATURE</u>								
Asian	-	-	3	2	3	3	6	4
Classics	20	13	56	42	61	45	80	47
English	133	52	172	113	342	211	532	318
French	92	41	104	68	184	115	257	152
German	18	7	19	10	59	27	78	40
Italian	3	1	2	1	8	6	13	6
Slavic (Russian)	9	2	10	4	14	8	25	18
Spanish	15	7	17	12	32	22	45	28
<u>LAW</u>	-	-	33	21	43	27	84	50
<u>LINGUISTICS</u>	11	3	41	26	67	41	118	69
<u>MATHEMATICS</u>	-	-	7	5	20	14	120	64
<u>PHILOSOPHY</u>	86	35	130	84	243	151	347	214
<u>POLITICAL SCIENCE</u>	139	53	140	97	250	154	295	179

See notes on next page.

... Appendix H

Table 1.3 (Cont'd)

Discipline	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
	number							
<u>SOCIAL PSYCHOLOGY</u>	94	25	30	24	83	51	197	110
<u>SOCIOLOGY</u>	90	50	140	87	211	121	303	174
<u>TOTAL</u>	<u>1053</u>	<u>429</u>	<u>1435</u>	<u>949</u>	<u>2504</u>	<u>1554</u>	<u>3603</u>	<u>2155</u>

Notes: Fellowships are listed under the fiscal year in which applications and awards were made although they were held during the following academic year.

Figures on awards relate to those originally offered by the Canada Council and do not take into account awards subsequently declined and re-offered.

Table 2 POSTDOCTORAL FELLOWSHIPS BY DISCIPLINE
1967/68 - 1968/69

Discipline	1967/68		1968/69	
	Applications	Awards	Applications	Awards
	number			
<u>ANTHROPOLOGY</u>	-	-	2	1
<u>ARCHAEOLOGY</u>	-	-	-	-
<u>DEMOGRAPHY</u>	-	-	-	-
<u>ECONOMICS</u>	4	4	10	4
<u>FINE ARTS</u>				
Architecture	-	-	1	-
Art History	-	-	-	-
Music	-	-	1	1
<u>GEOGRAPHY</u>	-	-	3	1
<u>HISTORY</u>	4	2	7	6
<u>INDUSTRIAL RELATIONS</u>	-	-	-	-
<u>LANGUAGE AND LITERATURE</u>				
Asian	-	-	-	-
Classics	-	-	5	4
English	2	2	6	4
French	1	-	2	1
German	-	-	-	-
Italian	-	-	-	-
Slavic (Russian)	-	-	-	-
Spanish	1	1	1	-
<u>LAW</u>	-	-	-	-
<u>LINGUISTICS</u>	1	1	4	3
<u>MATHEMATICS</u>	3	3	-	-
<u>PHILOSOPHY</u>	9	6	9	3
<u>POLITICAL SCIENCE</u>	3	1	4	2
<u>SOCIAL PSYCHOLOGY</u>	1	1	7	4
<u>SOCIOLOGY</u>	-	-	4	1
<u>TOTAL</u>	<u>29</u>	<u>21</u>	<u>66</u>	<u>35</u>

See notes on next page.

... Appendix H

Table 2 (Cont'd)

Notes: The programme of postdoctoral fellowships was first introduced in 1967/68.

The fellowships are listed under the fiscal year in which applications and awards were made.

The figures on awards relate to those originally offered by the Canada Council and do not take into account the rare cases where awards were declined by successful applicants and re-offered to others.

Table 3.1

LEAVE FELLOWSHIPS BY UNIVERSITY OF AFFILIATION

1965/66 - 1968/69 (Fiscal Year)

University of Affiliation	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
number								
BRITISH COLUMBIA								
British Columbia	13	9	24	19	34	25	35	25
Simon Fraser	-	-	3	3	5	3	6	3
Victoria	4	2	1	1	6	4	12	5
PRAIRIES								
Alberta	5	1	4	3	9	5	17	10
Calgary	-	-	4	4	9	4	11	4
Lethbridge	-	-	-	-	-	-	1	1
Manitoba	4	-	3	1	7	4	7	4
St. John's	-	-	1	1	-	-	-	-
Saskatchewan	3	2	3	2	5	3	7	3
Winnipeg	-	-	-	-	-	-	2	1
ONTARIO								
Brock	-	-	-	-	-	-	1	1
Carleton	7	3	9	9	3	1	14	9
Guelph	-	-	-	-	-	-	1	-
Lakehead	-	-	-	-	-	-	1	-
Laurentian	-	-	-	-	1	1	1	-
McMaster	6	1	5	2	6	5	6	2
Ottawa	2	-	6	4	6	3	5	4
Saint Paul	-	-	1	-	-	-	-	-
Queen's	1	1	5	3	4	3	8	6
Royal Military College	1	1	2	2	4	3	-	-
Toronto	13	8	17	12	18	14	35	24
St. Michael's	1	1	1	1	-	-	1	1
Trinity	-	-	1	1	1	1	-	-
Victoria	-	-	2	1	-	-	2	1
Trent	-	-	-	-	1	1	-	-
Waterloo	4	1	3	2	4	2	9	3
Waterloo Lutheran	1	-	-	-	-	-	1	1
Western Ontario	5	2	5	2	14	9	13	10
Huron	-	-	1	-	-	-	-	-
Windsor	-	-	4	3	5	5	5	3
York	2	1	3	3	7	7	11	5

See notes on next page.

... Appendix H

Table 3.1 (Cont'd)

University of Affiliation	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
	number							
QUEBEC								
Bishop's	1	-	-	-	-	-	1	-
Laval	2	2	4	3	3	2	7	3
McGill	3	3	4	2	5	5	13	10
Montreal	4	3	8	6	7	6	20	14
Loyola	-	-	1	1	2	1	2	1
Sherbrooke	-	-	-	-	-	-	1	1
Sir George Williams	2	1	3	1	-	-	3	1
ATLANTIC								
Acadia	1	-	-	-	-	-	1	-
Dalhousie	-	-	3	2	6	5	5	4
Memorial	2	1	-	-	1	1	2	2
Mount Allison	1	-	1	-	-	-	1	-
New Brunswick	5	4	7	5	3	2	5	4
St. Dunstan's	-	-	1	1	-	-	-	-
St. Francis Xavier	1	1	2	2	-	-	1	-
Saint Mary's	-	-	1	-	2	-	5	2
OTHER	4	-	9	1	4	-	16	2
TOTAL	<u>98</u>	<u>48</u>	<u>152</u>	<u>103</u>	<u>182</u>	<u>125</u>	<u>295</u>	<u>170</u>

Notes: Leave fellowships are listed under the fiscal year in which applications and awards were made.

The figures on awards relate to those originally offered by the Canada Council and do not take into account the rare cases where awards were declined by successful applicants and re-offered to others.

The category "Other" represents fellows who, at the time of their application, were either affiliated with an educational institution not listed in the above table or not affiliated with any Canadian educational institution.

Table: 3.2

LEAVE FELLOWSHIPS BY DISCIPLINE

1965/66 - 1968/69 (Fiscal Year)

Discipline	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
	number							
<u>ANTHROPOLOGY</u>	-	-	3	2	1	1	6	5
<u>ARCHAEOLOGY</u>	-	-	1	-	1	1	1	1
<u>DEMOGRAPHY</u>	-	-	1	1	-	-	-	-
<u>ECONOMICS</u>	7	1	11	9	19	16	16	12
<u>FINE ARTS</u>								
Architecture	3	1	-	-	2	-	4	1
Art History	1	1	6	4	5	1	8	2
Music	1	-	2	-	2	1	6	2
<u>GEOGRAPHY</u>	-	-	5	3	12	5	16	9
<u>HISTORY</u>	18	9	18	13	33	24	46	28
<u>INDUSTRIAL RELATIONS</u>	-	-	-	-	2	2	-	-
<u>LANGUAGE AND LITERATURE</u>								
Asian	4	1	-	-	1	1	2	1
Classics	1	1	9	8	6	4	4	3
English	33	16	21	16	27	21	50	33
French	2	1	6	4	9	8	19	11
German	-	-	2	-	4	1	4	2
Italian	-	-	-	-	-	-	2	1
Slavic (Russian)	-	-	1	1	1	1	-	-
Spanish	-	-	4	4	-	-	2	1
<u>LAW</u>	2	1	3	2	2	2	9	4
<u>LINGUISTICS</u>	-	-	6	4	5	3	8	3
<u>MATHEMATICS</u>	4	3	5	3	1	1	8	5
<u>PHILOSOPHY</u>	-	-	14	7	20	13	31	20
<u>POLITICAL SCIENCE</u>	12	6	16	12	12	8	15	9

See notes on next page.

... Appendix II

Table 3.2 - (Cont'd)

	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
	number							
<u>SOCIAL PSYCHOLOGY</u>	3	2	6	1	6	4	19	7
<u>SOCIOLOGY</u>	7	5	12	9	11	7	19	10
<u>TOTAL</u>	<u>98</u>	<u>48</u>	<u>152</u>	<u>103</u>	<u>182</u>	<u>125</u>	<u>295</u>	<u>170</u>

Notes: Leave fellowships are listed under the year in which applications and awards were made.

The figures on awards relate to those originally offered by the Canada Council and do not take into account the rare cases where awards were declined by successful applicants and offered to others.

Table 4.1
RESEARCH GRANTS BY UNIVERSITY OF AFFILIATION
1965/66 - 1968/69 (Fiscal Year)

University of Affiliation	1965/66			1966/67			1967/68			1968/69		
	Applica- tions	Awards	dollars	Applica- tions	Awards	dollars	Applica- tions	Awards	dollars	Applica- tions	Awards	dollars
BRITISH COLUMBIA												
British Columbia	10,353	10,353		140,185	88,898		118,074	99,426		231,979	145,333	
Notre Dame	-----	-----		-----	-----		-----	-----		2,000	1,920	
Simon Fraser	-----	-----		6,469	6,469		58,396	40,742		84,937	57,983	
Victoria	2,690	1,500		20,969	20,969		28,245	25,680		96,732	64,128	
PRAIRIES												
Alberta	12,855	9,250		51,492	20,802		198,451	151,031		405,651	190,805	
Brandon	-----	-----		400	-----		1,400	400		-----	-----	
Calgary	-----	-----		34,433	24,533		124,601	87,850		140,133	109,440	
Lethbridge	-----	-----		5,143	-----		6,725	5,350		13,179	7,300	
Manitoba	19,840	14,235		75,092	33,216		95,190	50,940		135,906	68,255	
St. Paul's	-----	-----		-----	-----		-----	-----		4,130	-----	
Saskatchewan	24,699	14,900		27,141	11,307		46,385	38,385		70,923	28,026	
Winnipeg	-----	-----		1,970	-----		-----	-----		4,000	-----	
ONTARIO												
Brock	-----	-----		1,550	1,550		37,587	4,202		32,680	14,670	
Carleton	24,550	23,550		17,210	15,310		33,805	32,324		166,870	97,248	
Guelph	-----	-----		16,325	11,275		55,974	29,919		36,962	29,683	
Lakehead	-----	-----		2,350	1,000		4,200	4,200		3,076	-----	
Laurentian	7,800	4,000		-----	-----		11,436	9,281		55,303	37,763	
McMaster	4,500	4,500		17,500	11,700		111,417	91,254		84,553	63,483	
Ottawa	12,130	9,650		42,325	13,852		82,583	63,580		98,389	77,076	
St. Paul's	-----	-----		-----	-----		3,050	3,050		3,400	1,900	
Queen's	66,674	54,505		35,106	35,106		142,406	142,406		130,114	97,766	

... Appendix II

University of Affiliation	1965/66			1966/67			1967/68			1968/69		
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
dollars												
ONTARIO (Cont'd)												
Royal Military College	2,288	2,288		4,825		1,825		4,061		9,528		9,528
Toronto	34,024	29,524		194,379		179,043		254,443		436,894		395,421
St. Michael's	-----	-----		1,894		-----		2,750		4,022		4,022
Trinity	-----	-----		-----		-----		-----		3,976		3,976
Victoria	-----	-----		300		-----		7,356		20,936		18,396
Trent	1,500	1,500		15,795		14,295		8,045		42,093		23,592
Waterloo	5,400	5,400		51,190		45,790		81,805		154,320		99,385
St. Jerome's	-----	-----		-----		-----		-----		2,500		2,500
Waterloo Lutheran	-----	-----		1,400		1,400		10,388		3,334		2,904
Western Ontario	14,626	12,526		87,069		84,069		103,772		88,398		84,327
Huron	-----	-----		-----		-----		1,102		1,008		-----
Windso	3,000	1,500		13,250		9,022		23,676		39,736		29,531
York	26,535	24,535		29,547		25,007		211,764		217,409		143,328
QUEBEC												
Bishop's	-----	-----		1,580		1,580		-----		6,398		4,813
Laval	26,558	25,083		85,537		40,947		101,980		99,344		94,319
McGill	71,719	50,580		67,902		65,202		159,690		287,198		260,147
Montreal	113,400	82,700		131,884		110,199		243,850		360,132		292,828
Loyola	-----	-----		3,800		3,800		2,775		16,051		16,051
Marianapolis	-----	-----		2,200		-----		-----		8,275		2,415
Sherbrooke	-----	-----		29,700		27,700		53,617		24,600		15,750
Sir George Williams	1,400	1,400		30,214		17,335		25,222		93,842		14,602
ATLANTIC												
Acadia	-----	-----		-----		-----		-----		2,495		2,495
Dalhousie	5,398	4,098		4,250		2,900		29,415		24,441		21,951
Memorial	1,000	-----		8,480		2,980		17,600		46,310		43,310
Moncton	-----	-----		2,700		2,200		4,945		41,891		5,000
Mount Allison	950	950		1,200		1,200		2,326		4,220		4,220
New Brunswick	8,132	7,382		8,800		5,800		36,877		20,656		18,849
Nova Scotia	-----	-----		-----		-----		-----		-----		-----
Technical College	-----	-----		-----		-----		4,194		4,194		-----
Prince of Wales	-----	-----		-----		-----		2,400		2,400		-----

See notes on next page.

Table 4.1 (Cont'd)

University of Affiliation	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
dollars								
ATLANTIC (Cont'd)								
St. Francis Xavier	-----	-----	-----	-----	5,280	3,780	7,148	4,374
Saint Mary's	885	-----	4,000	-----	800	800	1,271	1,271
OTHER	28,585	16,885	98,458	42,825	225,141	100,994	299,650	190,873
TOTAL	<u>531,491</u>	<u>412,794</u>	<u>1,376,214</u>	<u>983,000</u>	<u>2,785,199</u>	<u>2,101,853</u>	<u>4,168,993</u>	<u>2,903,558</u>

Notes: Grants are listed under the fiscal year in which they were awarded.

The main researcher's institutional affiliation has been used to assign applications and awards to particular universities.

The category "Other" contains grants to scholars who, at the time of their application, were either affiliated with an educational institution not listed in the above table or not affiliated with any Canadian educational institution.

... Appendix H

Table 4.2
RESEARCH GRANTS BY DISCIPLINE
1965/66 - 1968/69 (Fiscal Year)

Discipline	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
	— dollars							
<u>ANTHROPOLOGY</u>	-----	-----	58,757	57,257	145,051	107,716	225,118	163,969
<u>ARCHAEOLOGY</u>	3,000	3,000	35,072	33,572	10,673	10,673	65,754	43,286
<u>DEMOGRAPHY</u>	-----	-----	9,375	9,375	58,850	7,150	32,595	11,645
<u>ECONOMICS</u>	85,789	56,750	99,235	84,785	178,802	133,419	546,066	263,282
<u>FINE ARTS</u>								
Architecture	5,710	5,710	5,800	1,400	59,934	15,734	35,691	9,836
Art History	2,900	1,400	39,540	19,300	71,238	61,062	58,898	49,161
Music	9,155	5,355	12,600	9,300	10,375	10,375	65,726	55,450
<u>GEOGRAPHY</u>	3,350	1,850	89,208	34,059	118,428	85,654	240,352	161,657
<u>HISTORY</u>	28,333	22,028	153,884	101,487	314,818	246,694	481,775	368,837
<u>INDUSTRIAL RELATIONS</u>	4,449	-----	15,600	15,600	14,000	14,000	-----	-----
<u>LANGUAGE AND LITERATURE</u>								
Asian	12,000	10,500	3,000	1,500	18,660	17,160	43,716	40,844
Classics	2,435	935	14,952	11,280	18,039	18,039	54,422	45,759
English	30,695	26,350	82,793	60,668	200,127	176,020	271,736	222,923
French	11,355	7,650	52,883	33,343	78,216	72,846	114,331	91,736
German	884	884	14,415	14,415	38,946	38,946	33,302	21,905

See notes on next page.

Table 4.2 (Cont'd)

Discipline	1965/66		1966/67		1967/68		1968/69	
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
dollars								
<u>LANGUAGE AND LITERATURE (cont'd)</u>								
Italian	3,000	1,500	2,000	2,000	9,402	9,402	11,300	11,300
Slavic (Russian)	3,850	2,350	6,850	4,300	18,516	15,458	30,647	24,859
Spanish	3,750	3,750	15,395	14,695	17,377	14,977	44,946	37,374
<u>LAW</u>	11,500	11,500	21,525	16,525	85,400	85,400	175,517	171,882
<u>LINGUISTICS</u>	27,335	22,335	71,553	69,289	94,823	81,061	261,934	212,986
<u>MATHEMATICS</u>	2,953	2,953	25,650	25,650	50,400	50,400	7,755	4,355
<u>PHILOSOPHY</u>	5,820	4,630	43,637	36,937	83,846	68,519	63,507	46,319
<u>POLITICAL SCIENCE</u>	48,612	46,558	63,726	57,125	352,324	284,420	293,000	209,289
<u>SOCIAL PSYCHOLOGY</u>	17,376	13,676	121,223	95,430	224,596	181,266	313,419	243,300
<u>SOCIOLOGY</u>	180,000	141,450	265,333	151,810	361,850	218,264	639,062	378,370
<u>OTHER</u>	27,240	19,680	52,208	21,898	150,488	77,178	58,424	13,234
<u>TOTAL</u>	<u>531,491</u>	<u>412,794</u>	<u>1,376,214</u>	<u>983,000</u>	<u>2,785,199</u>	<u>2,101,853</u>	<u>4,168,993</u>	<u>2,903,558</u>

Notes: Grants are listed under the fiscal year in which they were awarded.

The category "Other" contains projects of an interdisciplinary nature as well as some projects in disciplines not listed separately because of the small number of applications and awards involved.

... Appendix H

Table 5
LIBRARY RESEARCH COLLECTIONS GRANTS BY UNIVERSITY
1965/66 - 1968/69 (Fiscal Year)

University	1965/66			1966/67			1967/68			1968/69		
	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards	Applica- tions	Awards
dollars												
BRITISH COLUMBIA												
British Columbia	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Notre Dame	3,700	-----	-----	-----	181,150	-----	-----	64,000	184,340	-----	70,000	-----
Simon Fraser	55,000	13,000	69,000	8,000	76,039	8,000	22,000	22,000	83,148	24,000	24,000	-----
Victoria	43,957	6,500	64,500	5,000	43,300	5,000	19,000	19,000	82,925	21,000	21,000	-----
PRAIRIES												
Alberta	52,624	45,000	98,000	44,000	510,025	61,000	61,000	61,000	316,520	67,000	67,000	-----
Brandon	30,558	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Calgary	20,000	4,500	31,000	8,000	43,545	17,000	17,000	17,000	85,870	25,000	25,000	-----
Lethbridge	-----	-----	-----	-----	-----	-----	-----	-----	13,360	-----	-----	-----
Manitoba	50,547	20,500	62,750	22,000	80,000	34,000	34,000	34,000	97,000	28,000	28,000	-----
St. Paul's	7,158	-----	15,000	6,000	13,000	-----	-----	-----	-----	-----	-----	-----
Saskatchewan	306,863	34,500	277,513	21,000	593,463	57,000	57,000	57,000	598,580	51,000	51,000	-----
ONTARIO												
Carleton	30,900	15,500	123,100	18,000	76,060	31,000	31,000	31,000	120,270	34,000	34,000	-----
Guelph	-----	-----	35,000	5,000	241,629	13,000	13,000	13,000	48,025	5,000	5,000	-----
Lakehead	-----	-----	-----	-----	14,000	-----	-----	-----	6,600	-----	-----	-----
Laurentian	-----	-----	-----	-----	-----	-----	-----	-----	44,375	-----	-----	-----
McMaster	181,880	23,000	233,880	19,000	110,355	68,000	68,000	68,000	185,351	68,000	68,000	-----
Ottawa	86,851	27,000	187,969	20,000	160,082	39,000	39,000	39,000	136,790	33,000	33,000	-----
Saint Paul	28,000	11,000	-----	-----	-----	-----	-----	-----	44,500	5,000	5,000	-----
Queen's	42,700	36,100	85,600	33,000	97,863	52,000	52,000	52,000	109,030	49,000	49,000	-----
Toronto	155,000	55,000	155,000	60,000	303,000	95,000	95,000	95,000	190,000	89,000	89,000	-----
St. Michael's	25,000	11,000	14,000	10,000	10,500	9,000	9,000	9,000	12,200	8,000	8,000	-----
Victoria	-----	-----	30,000	10,000	55,000	18,000	18,000	18,000	43,000	16,000	16,000	-----
Trent	55,000	-----	-----	-----	136,750	8,000	8,000	8,000	-----	-----	-----	-----
Waterloo	-----	-----	49,698	9,000	208,388	48,000	48,000	48,000	164,407	44,000	44,000	-----
Western Ontario	124,650	19,500	59,630	27,000	-----	-----	-----	-----	65,000	25,000	25,000	-----
Windsor	-----	-----	12,500	7,000	6,320	4,000	4,000	4,000	38,282	4,000	4,000	-----
York	146,961	-----	73,338	8,000	240,952	39,000	39,000	39,000	160,265	33,000	33,000	-----

See note on next page.

Table 5 (Cont'd)

University	1965/66			1966/67			1967/68			1968/69		
	Applica- tions	Awards	dollars	Applica- tions	Awards	dollars	Applica- tions	Awards	dollars	Applica- tions	Awards	dollars
QUEBEC												
Laval	70,500	40,500		107,500	34,000		174,000	61,000		186,700	55,000	
McGill	101,046	23,000		160,000	39,000		99,500	60,000		241,700	55,000	
Montreal	100,000	26,000		168,063	37,000		214,361	64,000		323,857	63,000	
Loyola	5,000	2,000		5,000	3,000		5,000	3,000		8,900	-----	
Marianopolis	-----	-----		9,000	-----		-----	-----		-----	-----	
Sainte-Marie	-----	-----		-----	-----		4,260	-----		-----	-----	
Sherbrooke	33,457	8,000		-----	-----		68,077	17,000		150,056	12,000	
Sir George Williams	12,500	-----		4,000	2,000		4,000	2,000		17,730	5,000	
ATLANTIC												
Acadia	4,000	1,000		-----	-----		20,000	-----		-----	-----	
Dalhousie	105,000	39,000		261,308	20,000		155,684	35,000		101,455	35,000	
King's	10,000	2,000		-----	-----		-----	-----		-----	-----	
Memorial	28,000	9,000		-----	-----		130,600	24,000		74,300	27,000	
Moncton	-----	-----		-----	-----		-----	-----		34,500	5,000	
Mount Allison	26,660	-----		-----	-----		5,000	-----		-----	-----	
Mount Saint Vincent	-----	-----		6,000	-----		-----	-----		-----	-----	
New Brunswick	36,520	20,000		60,000	20,000		134,322	31,000		155,017	33,000	
Nova Scotia Technical	7,000	5,000		-----	-----		-----	-----		-----	-----	
St. Francis Xavier	5,000	-----		-----	-----		-----	-----		16,000	2,000	
Saint Mary's	-----	-----		-----	-----		25,000	-----		-----	-----	
OTHER	70,000	67,500		5,000	5,000		28,000	8,000		54,000	9,000	
TOTAL	2,062,032	565,100		2,463,349	500,000		4,269,225	1,003,000		4,194,053	1,000,000	

Note : The category "Other" represents applications and awards for institutions other than those listed in the above table which may or may not have university affiliation.

APPENDIX I

THE GROWTH OF THE "UNIVERSE" OF DOCTORAL CANDIDATES AND ITS
RELATIONSHIP WITH THE COUNCIL'S DOCTORAL FELLOWSHIP PROGRAMME

Table A - Full-time graduate enrolment in Canadian universities and colleges

		<u>1963/64</u>	<u>1968/69</u>	<u>1969/70</u>	<u>1973/74</u>
1. All disciplines	No.	11,300	28,600	34,000	55,500
2. Social Sciences and Humanities	No.	5,800	16,000	19,000	31,100
% of all disciplines		51.3%	56%	56%	56%
3. Studying towards a Ph.D. degree: Total	No.	1,450	4,000	4,750	7,775
-- Canadian and landed immigrants	No.	1,160	3,200	3,800	6,220

Notes: Total enrolment figures are from the D.B.S. "Survey of Higher Education" for 1963/64 and based on W.M. Illing's and Z.E. Zsigmond's estimates for subsequent years.

The percentage of graduate students enrolled in the Social Sciences and Humanities has been established at 56 p.c. following the trend of recent years.

It is estimated that some 25 p.c. of the graduate students in the Social Sciences and Humanities are working towards a Ph.D. degree and that **non-Canadians account for about 20 per cent of this group.** Corresponding percentages in the physical sciences are believed to be substantially above these, i.e. around 40 p.c. and 35 p.c., respectively.

Table B - Full-time Ph.D. enrolment of Canadian students in foreign institutions

		<u>1963/64</u>	<u>1968/69</u>	<u>1969/70</u>	<u>1973/74</u>
1. In the United States	No.	590	1,230	1,340	1,950
2. In other countries	No.	265	410	450	650
All foreign countries	No.	855	1,640	1,790	2,600

Note: Data on the enrolment of Canadians in the United States for the past years originate from the publication "Open Doors", an annual review of the Institute of International Education while the enrolment in other foreign countries has been estimated on the basis of fragmentary reports available mainly from the United Kingdom.

Table C - Doctoral Fellowships requested and awarded in numbers and as a percentage of the "Universe" of Canadian doctoral candidates

		<u>1963/64</u>	<u>1968/69</u>	<u>1969/70</u>	<u>1973/74</u>
1. "Universe" of Canadian doctoral candidates:					
- in Canada	No.	1,160	3,200	3,800	6,220
- abroad	No.	805	1,640	1,790	2,600
Total	No.	1,965	4,840	5,590	8,820
2. Doctoral fellowships requested:	No.	674	2,504	3,603	6,800
- % of universe		34.3%	51.7%	64.4%	77.0%
3. Doctoral fellowships awarded:	No.	184	1,554	2,155	4,760
- % of universe		9.4%	32.1%	38.6%	54%

APPENDIX JSUMMARY OF A SURVEY OF CANADA COUNCIL DOCTORAL
FELLOWSHIP HOLDERS, 1958-59 to 1964-65

According to this Canada Council study, completed late in 1966, 97% of the Council's doctoral fellowship winners in the humanities and social sciences who studied in Canada were working in this country. As for those winners of fellowships who completed their studies in the United States or abroad, 80% had returned to work in Canada, and most of the minority then working in other countries hoped eventually to return. Some of the respondents to the survey had already worked in other countries and come back.

Almost all of the award-winners had received or were still working towards their Ph.D. The failure rate, at less than 4%, was marginal. The survey also indicated that 92% of the award-winners who had already received their doctorate had taken up teaching careers in the universities.

The survey was made among the 809 fellowship winners of the first seven years of the programme, from 1958-59 to 1964-65. A detailed questionnaire was mailed to all 809, and replies were received from 588, or 73% of the total.

The questionnaire revealed that all but 13% of the respondents then employed were working in Canada. 97% of the group who studied in Canadian universities were working here; 77% of those who took their doctorate in the U.S.A. had returned to Canada for employment; and the percentage of those returning from other foreign countries was even higher -- slightly over 90%. The combined repatriation rate was 80%, and of the 58 award holders who were working abroad, 34 hoped to come back. A significant number of the respondents had come back to Canada from working abroad.

The repatriation rate was higher for women (84%) and much higher for French speaking award holders (92.5%).

(NOTE: Full text of the survey is published on pages 150-155 of the Council's 1966-67 Annual Report).

APPENDIX 50

A SUBMISSION TO

THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICY

PRESENTED BY

THE NATIONAL FILM BOARD OF CANADA

January 1969.

An organization which provides communication services invariably encounters difficulty in relating its operations to a precisely defined activity. In providing visual information programs for the Federal Government departments of Canada over many years, the National Film Board has been involved to varying degrees in many phases of the disciplines related to the physical, natural and social sciences, and education. In some cases the Board's role has been to record data, but with the complexity of technological evolution and its growing impact on social welfare, the demand for advanced interpretative films has become much more important.

The purpose of this paper, therefore, is not to identify this organization as a scientific research institution but rather to comment on scientific policy from a position in the void between technological and social development.

The tremendous publicity given to the use of motion pictures for entertainment purposes has obscured the fact that Canada originated other uses of the camera as a means of documenting its developments and resources. The first known technical demonstration films were produced by Thomas Edison for the Massey Harris Co., and were presented at the Canadian National Exhibition in Toronto in 1898. The Canadian Pacific Railway originated the use of motion pictures to record life in Canada as a means of encouraging immigration in the year 1900. The decision to produce films as part of the program of the Exhibits and Publicity Bureau of the Department of Trade and Commerce in 1914 was further evidence of Canadian initiative. This country owes much to the foresight of these pioneers in the medium and the tradition of innovation and experimentation which they passed on to those who followed.

The purposes of the National Film Board as stated in its Act are:

"The Board is established to initiate and promote the production and distribution of films in the national interest and in particular -

- (a) to produce and distribute and to promote the production and distribution of films designed to interpret Canada to Canadians and to other nations;
- (b) to represent the Government of Canada in its relations with persons engaged in commercial motion picture film activity in connection with motion picture films for the Government or any department thereof;

Special Committee

- (c) to engage in research in film activity and to make available the results thereof to persons engaged in the production of films;
- (d) to advise the Governor in Council in connection with film activities; and
- (e) to discharge such other duties relating to film activity as the Governor in Council may direct it to undertake."

The National Film Board's activities relating to science may be categorized under two general program headings:

CONCEPTUAL PROGRAM

Objective:

The production, distribution, and utilization of informational and interpretative films and related materials dealing with the physical, natural and social sciences through the Board's Parliamentary vote, or as a result of funds invested by other government departments supported by the advisory services of appropriate scientists. These films are intended for audiences in Canada and abroad, and are available in as many as forty language versions as required.

The wide range of subject matter covered in this program is revealed in the following brief list of titles selected, at random, from a current catalogue:

MENTAL SYMPTOMS Series:

1. Schizophrenia: Simple-type Deteriorated
2. " : Catatonic Type
3. " : Hebephrenic Type
4. Paranoid Conditions
5. Organic Reaction-type - Senile
6. Depressive States: I
7. Depressive States: II
8. Manic State
9. Folie à deux

BIOLOGICAL SCIENCE:

1. The Development of a Fish Embryo
2. Embryonic Development - The Chick
3. Microscopic Fungi
4. The Changing Forest
5. Birds of Canada
6. Poisons, Pests and People

NATURAL SCIENCE AND WILD LIFE:

1. Glaciation
2. High Arctic: Life on the Land
3. Life in the Woodlot
4. World in a Marsh
5. Trout Stream
6. Water Fowl - A Resource in Danger

PHYSICAL AND APPLIED SCIENCE:

1. Antenna Fundamentals
 Part 1: Propagation
 Part 2: Directivity
 Part 3: Bandwidth
2. In One Day - Weather Forecasting
3. Auroral Rocket
4. An Introduction to Jet Engines
5. Isotopes in Action

PHYSICS OF UNDERWATER SOUND Series:

1. Basic Principles
2. Velocity Profiles
3. Absorption and Scattering

SOCIAL SCIENCE:

1. Knowing to Learn
2. The Living Machine
3. A Search for Learning
4. Indian Dialogue
5. Community Responsibilities

TECHNICAL PROGRAMObjective:

The study, design, development and evaluation of equipment and processes required to meet unique Canadian conditions or to support new concepts in the art and technology of film making, and related image-forming systems.

CONCEPTUAL PROGRAM

Historically, scientific endeavour has aimed at achieving a better understanding of the world and at developing valid theories concerning observable phenomena. The result has been the growth of separate disciplines and methodologies to permit detailed study of highly complex subjects. Increasing levels of specialization, however, have isolated scholars within rather rigid compartments which separated them, not only from other scientific disciplines but more importantly from the rest of the world.

Father John Culkin of Fordham University has pointed out recently that the development of our present communication systems has, in fact, eliminated rather than created gaps in our social order. At one time the parents could decide when and to what degree children would be permitted to participate in the adult world. Today, the average youngster can

CONCEPTUAL PROGRAM (cont'd)

extract as much visual information from television and related media as his parents. His entry into the more complex world cannot be regulated by the simpler methods of controlling access to information which were available before World War II. This continuous exposure to the adult world is creating a quite different kind of person. It is estimated that the average student leaving high school today has been exposed to more hours of television and motion pictures than to formal instruction. The optophonic man who may lack maturity and judgment is not deficient in factual information. Unfortunately, this knowledge cannot be fully separated from the emotional bias of the transmitting medium and this inevitably leads to certain distortions in interpretation of content.

Because the entire world can now share information, almost instantaneously it will become increasingly difficult to maintain the carefully constructed compartments of human activity and the mystiques associated with them. The apparent incongruities of our time, the technological advances which have polluted our air and water, the investment in the development of destructive systems of warfare when thousands of people are dying of starvation will be questioned more frequently and more vigorously in a world of increasing personal involvement. As a consequence of this situation much of the Board's experimental film program since EXPO has been directed toward study of the camera as an instrument to assess the impact of technological change on social welfare. Since this method permits two way communication it might be said that the National Film Board acts as one interface between man and the machine.

In developing these programs, the following objectives are considered:

1. Film as the subject under investigation:
 - (a) how does it communicate and motivate?
 - (b) what are the best methods of using it?
 - (c) how can one cause the audience to identify with and react to the medium?
 - (d) how does one assess the effect of this means of stimulating and recording man's reaction to his environment?
2. Film as a research tool:
 - (a) as a passive recording instrument operating in real time, in expanded time, in compressed time, in dimensions that are smaller or larger than life-size;
 - (b) as a selective instrument reacting to pre-programmed instructions;
 - (c) as an integral research step which is not necessarily the end product.

CONCEPTUAL PROGRAM (cont'd)3. Film as an information device:

- to report on research and scientific development and to interpret its effect on people.

EXAMPLES:

To illustrate this part of the Board's program, one experimental project, the "Challenge for Change" series is reviewed below in some detail. This will give some indication of the scope of the work and will provide insights regarding the nature and variety of interrelationships in the participating groups. Brief descriptions are given also of other related activities involving experimental methods.

In its first year of operation, the Challenge for Change program achieved significant results in its aim "to improve communications, create greater understanding, promote new ideas and provoke social change".

The concrete result was the production of 32 films which are proving effective in raising questions, provoking examination, and producing action in the field of poverty and social change.

Cooperation

Challenge for Change is by no means only a Film Board project. Seventeen federal government departments and agencies contribute to its cost, though at least fifty percent of any year's expenditure is provided by the Board. The contributing departments and the Board together set the objectives and general directions of the program but operating decisions, including the style and content of films, are the Board's responsibility.

In addition to government participation valuable cooperation has come from as many organizations -- universities, school boards, municipalities, social agencies, provincial governments and voluntary associations of many kinds.

Distribution

From the start, film distribution was conceived as a major part of the program, of equal importance with film production. Integrated teams of film-makers and distribution officers have worked on many of the projects from the earliest stages. From this teamwork has evolved promising new methods of film use.

Newfoundland Project

One of the first projects in Challenge for Change was the examination, in depth, of Newfoundland, to determine how effectively the film medium - both its production and utilization - can be used to improve communication between citizens and government.

It was decided, as part of the Newfoundland Regional project, to examine closely a small island fishing community off the eastern coast, Fogo Island. The aim of this project was to generate confidence in the inhabitants so that they could formulate and express their problems as they saw them, as the first step towards solving them. This was recorded on film and later, in unfinished form, screened for the Islanders. It was hoped that the playback of differences of opinion and contradictions in attitude would help the Islanders clarify, in their own minds, their position.

The film record reflected the concerns of the people on a variety of issues. Fishing methods and processing, education, welfare, local government and co-operatives were all dealt with. There was also an attempt to capture the human aspect of the Island. The footage and the issues raised by it were debated in the screenings and later on the streets, in the schools and in the stores.

It is believed that there are common denominators in communities affected by poverty and that the footage shot on Fogo Island will be useful in other areas. The material was examined by social scientists, Community Development personnel at Memorial University as well as local and Federal Government authorities. Then the footage was edited into twenty-six films. Prints will be distributed to Community Development and by National Film Board representatives who will take the films into Newfoundland communities with similar problems.

The nature of the Newfoundland Regional Project is purely experimental. The measurable returns will not be in for a long time. What it is doing, without question, is to stimulate an area, and eventually, several areas, to become more conscious of their needs and problems; and a more conscious community is far better able to anticipate and shape its future.

Lorne School Project

The Protestant School Board of Greater Montreal has approved National Film Board participation in a program designed to provide an enriched environment in a school located in the midst of a large area of poverty. This enrichment program is composed of four phases: a Headstart program for preschoolers, creative utilization of films within the regular school curriculum, a film-making project for the children in the school and, finally, parental involvement in film programs in the evening.

Initiated by the National Council of Jewish Women and the United Church of Canada, the Headstart program is designed to provide children in poverty with a number of experiences which are common to middle-class children before they enter the school system.

Within the school itself, the National Film Board made available every kind of audio-visual aid -- films, filmstrips, slides, 8mm single-concept loops, overhead projectuals and NFB still photographs. The object of this experiment was to teach the children visually what they cannot understand verbally in the curriculum. The teachers themselves were trained in the use of the equipment as well as in the creative implementation of films within the curriculum.

The idea of children actually making their own films within the school system is a unique departure in the project from the usual verbal learning process. In the Lorne School project, both high and low achievers worked together on the production of the films. The role of the adult film-maker in the group is very important because in many cases it was the first meaningful relationship these children have had with an adult.

Films were used in the evening Adult Education sessions initially to interest the parents in coming to the school. Through these sessions, the parents were informed about the daytime projects and encouraged to form interest groups of their own at night on whatever subjects attract them, with or without the help of the project organizers.

Results of this program will be published when it is completed in June of 1969. In the meantime it has attracted wide spread interest from specialists in education and social welfare in Canada and the

United States.

LEARNING PROBLEMS IN CHILDREN

The objectives in this series of films, produced in close co-operation with a group of Canadian child psychologists, was to fulfill a remedial role for younger children (about 7% of the school population) suffering from a series of functional disabilities, problems of body image and coordination, language problems, visual discrimination etc. These conditions in children are attributed to a variety of causes: minimal brain damage, hearing impairment, emotional difficulties or the effects of poverty. Extensive field testing was used to evaluate different production techniques in order to capture the attention of these young children and to involve them in a tactile sense with the teaching medium. In this experiment precise before and after measurements cannot be made. Evaluation is obtained through the careful observation of specialists. This program has received strong endorsement from scientists in the field and will be placed in international distribution in the near future.

THE HARVARD PHYSICS Series

The objective of this experiment was to determine how visual aid materials, in this case 8mm film loops, could be integrated with textbooks in a program dealing with basic physics concepts intended for teenage audiences. The project involved joint participation between a group of Harvard scientists and the Board in the production phase with later support from an international distributing organization. The subjects include such titles as Motion Acceleration, A Matter of Relative Program Orbit, Vector Addition, Standing Waves, Kepler's Law, etc. The production method involved very close association with the consulting scientists to create interesting and stimulating films which encourage interaction between the viewer and the projected image. Extensive field testing was used before the films were completed to insure that the loops were indeed achieving their aim.

This program has been successful in terms of meeting original conceptual objectives and recovery of costs through commercial sale contracts.

THE NETSILIK ESKIMOS

The National Film Board provided film production services to Educational Services Inc., a non-profit American organization financed by the U.S. National Science Foundation and Ford Foundation.

This ethnographic film project was an attempt to reconstruct and record the traditional culture of the Pelly Bay Eskimos as first reported by Rasmussen in 1919. Working with footage recorded by E.S.I., a series of nine films will be completed covering these subjects:

1. At the Caribou Crossing Place
2. At the Autumn River Camp
3. At the Mid-Winter Camp
4. At the Late Winter Camp
5. Jigging for Lake Trout
6. Stalking Seal on the Spring Ice
7. Group Hunting on the Spring Ice
8. Building a Kayak
9. Fishing at the Stone Weir

LABYRINTH

This theme pavilion and show produced by the Film Board for EXPO '67 is perhaps the best example of a major project which illustrates what can be accomplished through total integration of creative and technical talents. The stages in this project included:

- (a) Development of the conceptual plan to illustrate the theme, Man and His World.
- (b) Development and testing of prototype designs for technical equipment to record, duplicate and display the multi-screen concepts needed for this presentation.
- (c) The design of the architectural space in which several original automated presentation systems could be operated to maximum effect for the public.

It has been said that EXPO '67 established a milestone in visual communication, "a place in which entertainment became education". Those involved in various EXPO projects, in retrospect, suggest additional conclusions:

- (a) It marked the beginning, not the end, of new concepts in communication which need continuing study.
- (b) It revealed a considerable depth of multi-disciplinary talent in Canada for the creation of information environments which bring complex concepts to the average person in a manner that encourages voluntary participation.

LABYRINTH (cont'd)

- (c) EXPO provided an opportunity, unique in Canadian history, to experiment in the dynamics of human participation and involvement in information systems. It would be a tragic mistake to let the communication knowledge gained in this unique laboratory dissipate through failure to grasp its practical relevance to future development programs.

The foregoing summaries illustrate a continuing policy of experimentation with film in production techniques and in methods of utilization. The subject areas and the widely scattered audiences present conditions which are familiar to those in the social sciences in that they defy precise measurement of impact. Yet it is obvious that people need not only to be informed; they must also be assisted in interpreting the complex and rapidly changing environment with which they are surrounded. Film makers would be the first to admit that this area of communication needs more detailed investigation to establish theories and methods which will help to make their work more effective. At the same time there appears to be no substitute for the intuitive creative sense which determines when action is needed and in what form it is likely to have its desired effect.

TECHNICAL RESEARCH PROGRAM

The Board's Technical Research Division is staffed by nine men, three of whom are graduate engineers, the balance skilled technicians. It operates on an annual budget of \$130,000. In addition, technicians in other divisions are encouraged to participate where possible in development programs.

The objectives of this program are:

1. The design of new equipment or modification of existing equipment to meet the requirements of the experimental film program, to improve the quality of the product, to accommodate new processes and to meet the requirements of improved efficiency and economy.
2. The provision of consulting and testing services related to motion picture and photographic matters to other government departments and to the Canadian commercial film industry.

Canada does not have a large manufacturing capability to supply the more complicated requirements of the motion picture industry. A few attempts to construct equipment in Toronto have proven to be unprofitable because of the modest market demands.

TECHNICAL RESEARCH PROGRAM (cont'd)

With most of its specialized equipment imported from the United States, Great Britain or Europe, the evolution of the Board's technical research program followed a logical sequence of events:

1. Services to production teams could not be maintained while cameras, sound recorders, etc., were sent back to the United States or Europe for maintenance. The answer to this problem was the creation of internal maintenance facilities.
2. The repair of equipment which must hold very precise tolerances required instrumentation for measuring and assessment of performance.
3. Growing skill and knowledge in repair and testing combined to suggest modifications which would improve performance or permit the modernization of old equipment.
4. The Board's production program had to be related to all of Canada. It could not operate within the controlled environment or conventional procedures of the typical feature film studio. Consequently, a Canadian style of production adapted to local conditions of weather and geography, has been developed. In turn this has indicated the need for equipment of unique design in which manufacturers saw little prospect of immediate sales. Typical problems in this category would be:

Weather Conditions:

- (a) How to set up and lubricate a camera for exterior use in the Arctic.
- (b) How to adapt operating features to insure safety for the cameraman. For example, at 40 degrees below zero, it is virtually impossible, without freezing the hands, to manipulate small switches designed for studio use.
- (c) How to adapt to local conditions. For example, the Board has constructed a film studio in the Arctic from blocks of ice using Eskimo construction methods to record ethnological conditions.

Geographic Requirements:

- (a) How to provide dependable mobile field equipment which can be transported by canoe, dog sled or fishing boat as required.
5. Special demands imposed by the innovative nature of the Board's film production program. In attempting to present Canada and Canadians as they are rather than stilted stereotypes, it is necessary to create production facilities which permit normal operation without obscuring the dramatic content of what is being recorded or disturbing non-professional actors.

Typical projects of the technical program might be categorized under these headings:

OBJECTIVE I - EXAMPLES

- (a) Development of precise and stable current controls for motion picture and recording machines.
- (b) Automation of animation camera operation through the use of a computer control system and the design of appropriate interface circuitry. This has resulted in saving up to 65% of the time needed for certain very complex manual operations.
- (c) Development in 1950 of the Sprocketape recorder which reduced the weight of a studio quality unit to 50 lbs. as compared with the Hollywood equivalent of 300 lbs. This basic design is also incorporated into the Board's studio facilities which have been in operation since 1956.
- (d) Design of the first lightweight cordless sound camera used in the Board's pioneer work in the "cinema verité" production techniques. A major European manufacturer has incorporated many of these ideas in a camera now widely used throughout the industry.
- (e) Development of all camera, sound and projection systems as well as program control elements for Labyrinth.

OBJECTIVE II - EXAMPLES

- (a) Provision of information and advice on audio visual systems, theatre design, motion picture techniques to other Government departments and the private film industry.
- (b) Publication of a bulletin describing current technical development work at NFB which is circulated to seven hundred persons and organizations in Canada and throughout the world.
- (c) Presentation of scientific and technical papers to professional bodies such as the Society of Motion Picture and Television Engineers, participation in various national and international bodies ranging from the Canadian Standards Association to the Union Internationale des Associations Techniques Cinématographique (Paris).

FUTURE PLANS

The purposes and organization of the National Film Board obviously do not come within the conventional definitions of scientific programs and consequently it is difficult to discuss future development activities and related finances within the Committee's guidelines. The role of recording and interpreting information for and about Canadians must be, to a considerable extent, reactive. One cannot assume a purely pragmatic approach based solely on the success of a particular production method or specific advance in technology on the assumption that this course of action will meet future needs. To take such a position would imply that the methodology is more important than the content of an information service. Past experience has shown that this organization must be aware of a wide variety of developments in techniques and hardware

FUTURE PLANS (cont'd)

and must choose from these the best combinations to meet specific program requirements.

At this time the Board's immediate concerns about future developments are:

1. Examination of the process of making films.

Recognition of film making as one of the new creative arts of this generation is apparent in the rapid development of university courses devoted to the subject. Students have indicated intense interest in cinematography and early experiments have shown that the basic techniques can be taught even to primary school children. It, therefore, becomes essential to explore in more detail the potential of this medium. The Board's work on Fogo Island has revealed a new dimension in the use of film as an instrument of social development. This element of participation and involvement suggests many possibilities for further examination. Relatively little is known about the assessment of the impact of film on audiences, about its information storage capacity as compared to other systems, about its relationship to other processes in the creation of information environments etc.

2. The computer and film.

The Board is presently using a small computer to control a number of operations on an animation stand. In addition a larger computer is used on a shared-time basis to perform complex calculations of animation equipment movement and some preliminary work has been done in the use of a computer to generate drawings which are copied on film to create an animation sequence. Electronic slates and light pens provide unusual possibilities for the creative artist to react directly with the computer in the development of programming techniques which are not limited to the constraints of mathematical logistics. The possible applications of the computer in film editing, sound recording or as an indexing method for high definition film memory banks etc., are worthy of more study.

3. Film utilization.

The rate of increase of human knowledge presently exceeds our capacity to record, distribute and use it intelligently. Many textbooks are obsolete by the time they are published. In a similar manner the capacity of presently available film processes to meet anticipated future needs is very limited. The movement of film in cans to meet immediate reference requirements is, of course, an anachronism even now. It is fortunate that film images can be converted to electrical impulses for immediate dispatch to points of need. Among the many alternatives being considered, discussions are now under way, for example, regarding the possible establishment of an "electronic highway" to connect Boston and Montreal (with later extension to Washington). There are also the possibilities of producing low cost film copies on 8mm film or through the electron video recording method for home viewing through a converted television set. This is a particularly explosive area of development in which the impact will become much more apparent in the period of 1971-1975. At the same time this technological advance will render our present antiquated copyright laws totally obsolescent which suggests another area for urgent study.

SUMMARY:

The process of film making is by its very nature innovative, exploratory and rarely routine. This kind of environment attracts and intrigues a stimulating cross section of Canadian professional and non-professional talents. At the present time the Board's staff includes poets and journalists, architects and biologists, medical doctors and lawyers, artists and draftsmen, engineers and technicians, teachers and drop-outs. In presenting its views on science policy, the Board does not presume to qualify as a scientific research organization within classical definitions of such activities, it does feel, however, that the nature of its operations, the sensitivity of its staff to current conditions in Canada as revealed in production research and audience reaction provides some insights which may serve this Committee of the Senate.

SUMMARY: (cont'd)

It should be made clear that the purpose of these observations is not to endorse or recommend some program of the "popular science" category to enhance or propagandize Canada's scientific efforts. This has been done in the past and presumably will continue to make a contribution in the future. It seems more important that a statement of Canadian policy in the field of science should recognize and reflect some of the changing values of our time:

1. The increasing gap between the rate of technological development and the real progress of human welfare.
2. The alienation of youth from nineteenth-century value systems -- systems which have allowed science (as well as many other disciplines) to become too isolated from the human dimension. This is reflected in the rejection of science by youth in the United Kingdom as reported by the Royal Society, the Association of University Teachers, and Sir James Taylor's observations.
3. The emergence of the informed adolescent who is exposed to and retains most of the current factual knowledge possessed by adults at a much younger age.
4. The disenchantment with a technological society which has not solved the problem of providing reasonable benefits to all levels of the population, and has pursued programs which reflect narrow views of self-interest without adequate thought of consequences.
5. The problems to be faced with the deluge of published material in most disciplines which exceeds human capacity for intelligent use.
6. The change in human communications from text orientation to electronic systems and the need for science to adapt to this process of evolution.
7. The need for scientific development programs to emerge from the constraints of the compartmental system and to recognize the advantages of multi-disciplinary approaches to problems which have been displayed in an impressive manner during World War II, EXPO '67 and the American space program.
8. In view of Canada's reasonably moderate resources, the need to focus attention on the areas in which significant advances may be made instead of piecemeal programs designed to give too little to as many as possible.
9. The importance of creating an atmosphere in which productive research can flourish. This creative process cannot develop its full potential in either a totally permissive or a completely rigid policy structure.
10. The impact of developments within one discipline on those of another discipline. The explosive progress in communication technology now makes it virtually impossible to enforce existing copyright laws. Despite this obvious fact and its serious implications with respect to contractual obligations involving intellectual properties little or no original research work on copyright is being carried on at Canadian Universities. It is, therefore, possible to assume that major improvements in handling data through the use of electronic systems could be delayed through legal suits until legislation catches up with what is now technical fact.

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Concluding observations with reference to the specific terms of reference of the Senate Special Committee on Science Policy.

- (a) Canadian research programs in the field of motion picture film communication methodology and technical processes lags considerably behind that of the Socialist countries of Europe. As a typical example, Czechoslovakia having a population comparable to this country employs two hundred scientists and engineers in the VUZORT Institute (Canadian equivalent three engineers and six technicians) which is concerned solely with motion picture processes. In addition, the state controlled studios such as Barandov and the museums are used for experimental programs of various types. The benefits of this program are notable in that country's international critical and financial success in feature film production as well as the highly imaginative presentations such as *Laterna Magika* and the national pavilion at EXPO. In the United States and most of the other western countries, experimental work in equipment and materials is carried out by the manufacturers. Recently the American film industry has moved to re-establish its former Research Council through the creation of the Motion Picture and Television Research Center. However, the democratic countries generally appreciate the growing need for more study of the film medium as the era of hardware orientation gives way to increasing emphasis on content.

In this area, the Film Board enjoys a unique international reputation for innovation. It is hoped that there will be continuing opportunity to develop this asset which has served as the model for most government film agencies since World War II.

In terms of research program, it is likely that more benefit can be gained from study of experimental production techniques than the development of equipment. The latter activity would

(a) (cont'd)

be a questionable venture in Canada in the light of a small domestic market and the industrial advantages which other countries possess through well-established supporting services (optics, instrumentation etc.) needed to maintain competitive costs.

- (b) It is difficult, if not impossible, to determine what research programs are under way within the Federal Government structure. Quite likely this situation has led to the rather loose application of the term (perhaps as a status symbol) to cover inconclusive activities and to permit duplication of effort.

It would seem, therefore, that some coordinating body is needed to provide such services as:

1. Maintaining a central source of information on all Federal research programs, manpower resources and facilities.
2. Through the use of appropriate committees to review scientific research needs in terms of the multi-disciplinary talents available and designated national goals. There appears to be much merit in assessing research proposals in terms of the problem involved as well as on the narrower basis of departmental interests and mandates. A very determined effort must be made to break out of the traditional compartments in this respect.
3. Through a knowledge of the programs under way, the co-ordinating agency might identify gaps in planning where a major advance in one field simply creates new burdens in another area in which a parallel supporting activity should have occurred.

The objective of the coordinating agency, perhaps an expanded responsibility of the National Research Council, would be to create a research mosaic in which the

Special Committee

(b) 3. (cont'd)

individual areas of expertise would continue to function with provision for greater opportunity for cross-fertilization and interdepartmental projects.

(c) Federal assistance to research and development activities might take the form of selective tax concessions to encourage projects which are in the national interest. Some allowance in the form of a special departmental research fund, might be made available when Parliamentary estimates are considered. This fund, limited to some specific percentage of a total vote, would be available only for approved projects. If approved, the investigation might be assigned by the Department concerned to other qualified organizations or individuals. This would create more incentive to develop research programs and they would not become lost as expendable items within a department's other priorities.

(d) In the long view, Canada's science policy should aim for:

- (a) A financial structure tied to the Gross National Product.
- (b) The creation of a regulatory body which would recognize and assess both the scientific and humanistic implications and goals of development programs. Particular attention here would be directed to discrepancies in the rate-of-increase of technological achievement as compared with that of social welfare.
- (c) The development of an information support program for science activities to encourage greater understanding and participation both in man and his world.

APPENDIX 51

RESEARCH BY THE CANADIAN WHEAT BOARD

A Brief from The Canadian Wheat Board to the Senate Committee on Science Policy

Conclusions and Recommendations

1. The Canadian Wheat Board is the exclusive marketing agency for Western Canadian wheat, oats and barley. The Board is given no statutory research functions. It has, however, initiated a number of research projects in order to secure the benefits of expanding knowledge and technological advance. It has also collected, since its inception, exact and detailed statistical data on all activities affecting its country, terminal and foreign operations.
2. In an era of almost fervent scientific activity in which rapid progress is being made in nearly all fields, the grain industry, and The Canadian Wheat Board in particular, cannot afford to underrate the benefits to be derived from scientific research. A broad, intensive and co-ordinated research effort by the entire industry is required. The proposed National Grains Council may prove to be the body which can provide the direction for and co-ordination of the research effort required.

Canadian Wheat Board Research

3. The Canadian Wheat Board was established as a Crown Corporation under The Canadian Wheat Board Act of 1935. Section 25 of this Act stipulates that "The Board shall undertake the marketing of wheat produced in the designated area in interprovincial and export trade." Section 5 (1) states that, "Subject to regulations, the Board shall sell and dispose of grain acquired by it pursuant to the operations under this Act for such prices as it considers reasonable, with the object of promoting the sale of grain produced in Canada in world markets."

The Canadian Wheat Board then, is invested with the responsibility to market Western Canadian wheat, oats and barley. In essence, its control extends from the farm to the seagoing vessel. The Board issues to producers' delivery permit books, sets delivery quota levels, generally controls the flow of all grains from country elevators to terminal positions, makes sales for designated shipping periods and positions, and daily establishes asking prices for all grades of wheat in all export positions. The services of the Winnipeg Grain Exchange are utilized by the Board in selling oats and barley in store, the Lakehead or Vancouver. The Wheat Board renders to the producers all funds earned from the sale of grain less marketing costs and Board administration costs.

4. An organizational block diagram showing the main divisions and sections of The Canadian Wheat Board is attached.
5. No explicit statutory functions or powers regarding scientific research are written into The Canadian Wheat Board Act. The Board's prime responsibility is to market the Western Canadian farmers' grain. It has never pursued a systematic policy of continuous research, but has, rather, undertaken research projects as they became necessary to enhance the Board's marketing activities. No organizational policies have therefore evolved which would define the Wheat Board's "policy toward science." Grain market research has traditionally been conducted by The Canadian Wheat Board, other federal agencies and the universities, largely independently of each other. However, with the establishment of the proposed National Grains Council, all federal agencies concerned with grain marketing as well as the organizations within the grain industry may undertake a more ambitious and

co-ordinated role in this area of research.

6. No defined steps are currently taken to hire members of university graduating classes for purposes of doing research. Personnel with university training and research experience are hired, but mainly to fulfill other functions. On occasion, they become involved in research projects.
7. In spite of the fact that the Wheat Board has no statutory powers in the area of market research, it would be impossible for any organization with the Board's authority and responsibility to function effectively without becoming involved in scientific pursuits as defined in Appendix B of the Senate Committee's "Guidelines." Of the five categories of research activity distinguished, The Canadian Wheat Board is involved in two: data collection, and research and development. But it is only in the area of data collection that the Board has been active on a continuous basis.
8. All Wheat Board research is conducted by or under the direction of personnel in the Winnipeg head office.

Data Collection

9. All data collected are for operational purposes. Information supplied by a producer to the Board is regarded as "strictly confidential."
10. Statistical data of legal land descriptions, acreage by individual crops, and owners and tenants of land are obtained from the Producer's Delivery Permit Books which are issued annually for each farm unit.
11. A record of each delivery of grain by farmers to country elevators is kept through the medium of Cash Ticket-Producers Certificate forms

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which are issued by elevator agents at the time of delivery. The certificate portions and related reports provide the Board with information on the volume, the kind and the grade of grain marketed.

12. Data on stocks of grain by grade on hand in all country elevators, receipts from producers, and shipments from country elevators are secured weekly from the "Form 101." The Form 101 is submitted weekly to The Canadian Wheat Board by all country elevator managers in the Board's designated area.
13. Complete statistical data are maintained on the amount of monies advanced and the repayments made under the Prairie Grain Advance Payments Act, of which the Board is Administrator.
14. The Board maintains complete data for all wheat sales in regard to the quantities sold, the selling prices, the grade of wheat involved, the destination of shipment, the port of exit for export grain and the period of shipment.
15. Special questionnaires completed by country elevator managers as required (usually four or five times a year), to secure statistical data by individual grains and grades, relative to production, farm stocks, farm requirements for feed and seed, and farm stocks of grain available for delivery to commercial facilities.
16. Data on acreage, yield, production, prices, imports and exports for all grains in virtually all countries in the world are collected continuously from secondary sources by Wheat Board personnel.

Research and Development

17. No basic research (i.e., research without specific practical application)

is undertaken by Wheat Board personnel. Research which has been conducted can, almost without exception, be classified as applied (i.e., research which is directed toward specific practical applications). As requested in the "Guidelines," only those projects which have been conducted since 1962 will be described in this brief.

18. Members of the Board are almost daily confronted with a host of problems requiring immediate decisions. To assist them in making sound decisions about short term marketing problems, they are able to call on technical experts trained in such diverse fields as economics, the agricultural sciences, computer technology and statistics. These technical personnel are able to draw on detailed knowledge of their fields and outline the alternative courses of action available.
19. Close surveillance of changing circumstances in all wheat importing and exporting countries is made by the three professionally trained members of the Board's Technical Services and Market Research Department. Their duties encompass such diverse functions as the collection of all information relevant to the sale of Canadian wheat in international markets, the dissemination of information about the Canadian grain situation, and customer service. Special attention is devoted to the milling and baking industries in wheat importing countries. The staff of this department, however, undertakes only short term studies. No long term research regarding the underlying technical, economic or political forces which affect supply and demand in individual foreign markets is pursued.
20. For an 18 month period in 1966 and 1967, The Canadian Wheat Board financed two graduate students at the University of Wisconsin while they worked on research projects for their doctoral dissertations.

The objective of the first study, by H. F. Bjarnason and entitled "An Economic Analysis of 1980 International Trade in Feed Grains," was to predict 1980 world feed grain prices, production, consumption and trade flows for the major feed grain trading nations. The objective of the second study, by A. Schmitz, entitled, "An Economic Analysis of the World Wheat Economy in 1980," was identical, except that the commodity involved was wheat rather than feed grains. To accomplish the objective, demand and supply equations were estimated by the use of multiple regression techniques for each of the major trading nations, and these equations were then adjusted to represent 1980. For the remaining regions, point projections of production and consumption were made. The equations were adjusted to account for transfer costs and political policies, and equilibrium solutions were then achieved by the use of a quadratic programming algorithm developed for spatial equilibrium models by Takayama and Judge, and modified for international trade by Bawden. The two grain models now permit analyses of the probable consequences to Canadian grain producers of changes in domestic or foreign grain or trade policies.

21. The Data Processing Division of The Canadian Wheat Board is devoting increasing time and effort to research into systems and procedures, data processing and computer applications. The knowledge gained by the exploratory work of this department is being made available to other sectors of the grain trade.
22. A University of Manitoba graduate student in Computer Science, Mr. D. B. Fast, is currently being sponsored by the Board to investigate the nature and usage of primary data covering all aspects of grain handling. He intends to define these elements of data with

quantities and interrelationships clarified, and to show conceptually how an information gathering system can reduce redundancy, improve efficiency of information dissemination, and provide a data base of information of value to the entire grain trade.

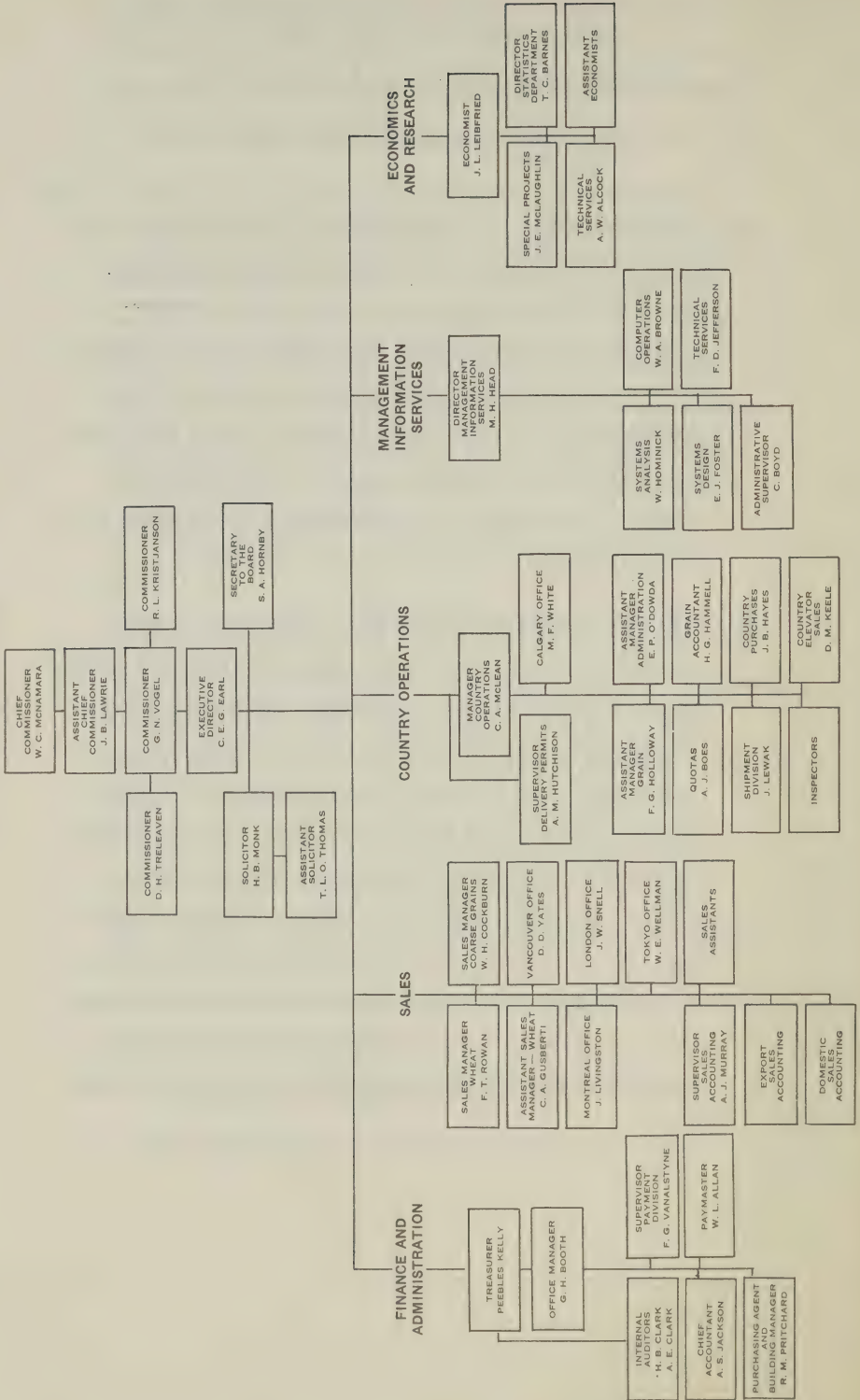
23. Long range plans are currently being directed toward the ultimate implementation of an Integrated Real-Time Management Information System for the grain trade. Two segments of the proposed system became operational with the commencement in the current crop year of: (a) the Producer Account Identification System, which provides a means of permanently identifying a producer and through the use of optical scanning techniques eliminates former manual methods required to introduce data into the computer system, and (b) the Churchill Terminal Project, which relieves the Wheat Board and grain companies of previous error-prone manual systems, and provides them with information from Churchill in as close-to-real-time as possible. The Churchill Terminal Project has forcefully demonstrated the practicability of exploiting new technologies such as telecommunications, multiprocessing, and real-time systems.
24. Other developments in the Data Processing Department which may be completed and applied in the near future include (a) a railway conveyance allocation and grain intransit project. This will involve the development of a comprehensive data base to be on line in large disk files capable of being interrogated by management through the use of display terminals, (b) Fort William and Vancouver terminal projects similar to the presently functioning Churchill pilot project, and (c) the development of a telecommunication network to serve the grain trade across Canada. Each agency, including the railways, lake shippers,

brokers, buyers, terminals, country elevators, the Board of Grain Commissioners and The Canadian Wheat Board would transmit to and receive from a central exchange and repository of data, information pertinent to the requirements of the enterprise.

25. In the area of grain handling and transportation, a Wheat Board Commissioner and two economists have participated, in co-operation with representatives of the two major railways, the country elevator companies and the Board of Grain Commissioners, in the research program of a technical group appointed by the Grain Transportation Committee. The Grain Transportation Technical Group was established in the spring of 1967 to investigate the entire Western Canadian grain handling process, and to devise the most efficient system possible for moving grain from farms to the holds of ships docked at terminal elevators.
26. The Technical Group has made recommendations for ways to increase the throughput of grain at the West Coast, and for ways of loading grain with greater protein uniformity into vessels at Vancouver. Current projects include the development of a management information system for the grain trade, the development of a simulation model of the Western Canadian grain transportation system, and the development of a new system of ordering and moving grain from the country to terminal positions which is both very highly controllable and dependable.
27. The following reports have been published and distributed by the Grain Transportation Technical Group:
 - (a) "Proceedings of the Grain Transportation Workshop," September 6, 7 and 8, 1967.
 - (b) "Shipping Orders," Technical Report No. 1, October, 1967.

- (c) "A Proposal for a Co-ordinated Shipping Order System,
"Technical Report No. 2, March, 1968.
 - (d) "Movement of Grain Through West Coast Ports,"
Technical Report No. 3, March, 1968.
 - (e) "Management Information, "Technical Report No. 4,
March, 1968.
28. A request is made in 2.10 of the "Guidelines" for commentary on the probable effects in the next 5 to 10 years of scientific activities in general on the Board's operations. It is, of course, virtually impossible at this point in time to predict what technological advances will be made; nevertheless, three of the areas in which scientific developments may be sufficiently revolutionary to affect Wheat Board operations are: (a) the development of new, high yielding grain varieties, (b) innovations in grain handling and transportation, and (c) the development of new milling and baking techniques.
29. New, high yielding grain varieties would affect acreage seeded to individual grains, the outlets for these grains, and the prices at which the grains would be marketed. Innovations in grain handling such as the introduction of telecommunications for instant data transmission, the use of unit trains and super ocean bulk carriers for the transportation of grain, and the development of large, centralized country delivery points would make the Wheat Board's operations more effective. The development of new milling and/or baking techniques could affect the demand for the hard spring wheat varieties grown on the Canadian prairies relative to the demand for other kinds of wheat. The results of these scientific activities would in no way affect the Board's current function and responsibility -- the orderly marketing of grain.

THE CANADIAN WHEAT BOARD



APPENDIX 52
FARM CREDIT CORPORATION

Brief to

THE SPECIAL SENATE COMMITTEE ON SCIENCE POLICY

1. Since the Farm Credit Corporation does not engage in scientific activities, this brief is confined to Sections II.2.2 and II.2.10 of the Guide for Submissions of Briefs.

2. Organization and Function

The Farm Credit Corporation was established by the Farm Credit Act (1959) and reports to the Minister of Agriculture. The functions of the Corporation are to make, administer and supervise farm loans as provided for in the Farm Credit Act and the Farm Machinery Syndicates Credit Act. Under the Farm Credit Act long-term loans are made to acquire and to improve farm land, to improve or erect farm buildings, and generally for purposes to increase farm efficiency and to increase the value of farm businesses. Under the Farm Machinery Syndicates Credit Act, the Corporation makes intermediate-term loans (up to seven years) to farm syndicates (groups of three or more farmers organized under this Act) for the joint purchase and operation of farm machinery.

3. The Corporation has five members appointed by Governor in Council. The Head Office is in Ottawa. There are seven Branch Offices and 127 field offices. Total staff is 630.
4. In the last fiscal year the Corporation made 12,000 loans amounting to \$264 million. The Corporation has some 63,500 outstanding loans, one for every four commercial farms. About one billion dollars in loans is outstanding. Funds for loaning are provided by the Minister of Finance.

II.2.10 For organizations not currently engaged
in scientific activities

5. Although the Farm Credit Corporation is not engaged in scientific activities, its policies, responsibilities and operations are profoundly affected by new scientific and technical developments. The primary impact of scientific developments on the Corporation's activities is through their effects on the technology, operations, organization and financing of farming. A secondary effect of scientific developments is on the operations of the Corporation itself through improved management, staff training techniques, data processing, communications and generally in timeliness and efficiency of operations.

6. The exploitation of scientific developments has resulted in profound changes in agriculture in recent years. Mechanization, electrification, the use of chemicals and drugs and other technological developments have made possible much larger and more productive farm businesses, have resulted in greatly increased purchases of goods and services used in farming and in an increasing application of farm and business management skills.
7. The changes in farming which are most significant from the point of view of financing the farm sector are the expanded acreages, the larger and more sophisticated farm buildings and material-handling equipment, bigger and better field machinery and the more extensive use of fertilizers, pesticides, feed additives, etc.. To exploit the technological advances in crop and livestock production requires a larger long-term investment in land and buildings, larger intermediate-term investment for equipment and livestock and much larger annual cash outlays for operating expenses.
8. The technological developments referred to above have affected the organization and structure of farms. Very high capital requirements have encouraged two or more farmers, often related, to co-operate in the operation of farms. The nature of co-operation varies from simple exchanges of labour or machinery to partnerships and family farm corporations. Farming operations have become more specialized and require considerable technical and business knowledge by the farmer.
9. These developments in technology and farm organization have resulted in a continuing review and up-dating of the legislation and of the Corporation's policies and operations to meet the needs of modern farm finance. For example, on several occasions the maximum size of loans to farmers has increased, and provisions have been made to make loans to groups of farmers and to family corporations. The Farm Machinery Syndicates Credit Act was implemented to assist in reducing farmers' investment and operation costs for farm machinery. Proposed amendments are now before the House of Commons which would broaden this Act to provide loans for purposes other than to buy machinery. Provisions have been made for greatly increased funds for farm credit, recognizing that adoption of technological advances and scientific developments means higher capital requirements. Higher capital requirements have imposed difficulties on young people who wish to take up farming.

Proposed amendments to the Farm Credit Act are now before Parliament which provide for larger loans in relation to total farm assets to this group if the borrower has adequate management ability and will accept the advisory services supplied by the Corporation staff. This has imposed a requirement for highly trained staff who are able to provide this service.

10. The revolution in electronic data processing has had its impact on farms.

A relatively recent development in this area has been the implementation of simplified methods of maintaining and analyzing farm business accounting records. Farmers send to a computer centre monthly records of farm business operations for tabulation and analysis. Although there are many systems and agencies in North America developing and operating such systems, it is believed that the Corporation's program includes more farmers than does any other agency in North America if not in the world. Through this program a valuable and unique bank of data is being accumulated. This experience has also been a contributing factor in developing a Canadian Farm Management Data System.

11. Another kind of scientific development which has an impact on the Corporation's activities is research in the social sciences and particularly in agricultural economics. The Corporation makes long-term loans for periods up to thirty years. Research in long-term projections of demand for and supply of farm products is therefore of considerable importance to the Corporation. Research into the probable supply response to changes in demand in different regions of the country is also of significance in the Corporation's operations. Research into the changing organization, structure and productivity of farms and projection of such changes into the future is also very relevant. Additional research fields of importance to the policies and operations of the Corporation are: research into changing capital and credit requirements, the demand for and supply of capital, the institutions affecting the demand and supply of funds, farm credit needs, alternative methods of providing farm capital, land tenure research and farm management research into the most profitable types, sizes and kinds of farm operations as well as into management requirements. The Corporation considers it essential to be advised on research results and of the implications of these results for its policies and operations.

12. The Corporation relies on various agencies for research in these areas.

Among these agencies are the Canada Department of Agriculture, Departments of Agricultural Economics at Universities, the Agricultural Economics Research Council of Canada and various commissions, inquiries, task forces, etc..

In some cases, the Corporation undertakes co-operative studies with the Canada Department of Agriculture and in others, it contracts studies.

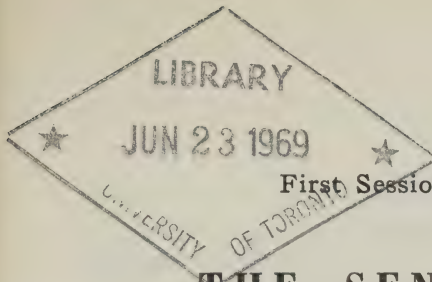
13. Some of the impacts of these scientific and research developments over the next few years on the Corporation's policies and operations are indicated in legislation now before Parliament which would:

- (1) increase the loaning capacity of the Corporation by 35 per cent to nearly \$1.4 billion;
- (2) expand the authority to lend to farmers who have organized their businesses as farming corporations or co-operative farm associations;
- (3) make it easier for a farmer to start his son in farming;
- (4) enable the Governor in Council to establish interest rates rather than having them prescribed in the Act as at present;
- (5) enable loans to be made to Indians on reservations;
- (6) enable the Corporation to assist in administering funds under the Fund for Rural Economic Development Act;
- (7) increase the maximum loan where two or more farmers are farming together and
- (8) enable loans to be made up to 90 per cent of the value of the security to those with more than average managerial skill.

14. With respect to the Corporation's own operations, the Corporation has commissioned a number of studies over the last five years to improve the effectiveness of its work in the light of scientific and technological developments. These studies have been undertaken by management consultants and include a study of the Corporation's data processing and steps which might be taken to incorporate latest techniques in this field. In the management area other studies have been made on organization, salaries, administration and management structure and co-ordination. The Corporation also uses internal task forces to study and make recommendations on certain types of problems.

15. In summary, the scientific and technological developments which are occurring in agriculture profoundly affect the policies, responsibilities and programs of the Corporation. They impose requirements for highly trained staff, greatly increased capital requirements, refined techniques and policies in the provision of loans, advice and supervision to farmers and for sophisticated management and data processing methods in the Corporation's operations. Although some research work has been done by the various agencies in the economic and social aspects of farming, it is considered that this type of research has seriously lagged behind research in the biological and natural sciences in agriculture. With the rapid commercialization of agriculture and of farm finance which has been occurring in the past and its undoubted continuation, it is considered that economic and farm management research will be of even greater importance in farming and in its impact on the Corporation's policies and operations in the future.

Farm Credit Corporation,
P.O. Box 4209,
Postal Station "E",
Ottawa 1, Ontario.
November 13, 1968.



First Session—Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA
PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*

The Honourable DONALD CAMERON, *Vice-Chairman*

No. 42

WEDNESDAY, APRIL 30th, 1969

WITNESSES:

Department of Industry, Trade and Commerce: Jack Hamilton Warren, Deputy Minister; David B. Mundy, Assistant Deputy Minister; V. J. Macklin, General Director, Office of Economics Branch; Hugh Charles Douglas, Deputy, Industrial Research Adviser; R. K. Brown, Deputy (Scientific), Office of Science and Technology; and D. G. Boxall, Scientific Consultant-Materials, Office of Science and Technology.

APPENDIX:

- No. 53—Brief submitted by the Department of Industry, Trade & Commerce.
- No. 54—Brief submitted by the Department of Public Works.
- No. 55—Brief submitted by the Emergency Measures Organization.
- No. 56—Brief submitted by the Dominion Coal Board.
- No. 57—Brief submitted by the Library of Parliament.
- No. 58—Brief submitted by the Public Archives of Canada.
- No. 59—Brief submitted by the St. Lawrence Seaway Authority.

MEMBERS OF THE SPECIAL COMMITTEE
ON
SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*
The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,
The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,
The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, April 30, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Aird, Belisle, Bourget, Carter, Grosart, Haig, Kinnear, McGrand, Robichaud, Sullivan and Yuzyk—12

In attendance: Philip J. Pocock, Director of Research (Physical Science)

The following witnesses were heard:

DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE:

Jack Hamilton Warren, Deputy Minister;

David B. Mundy, Assistant Deputy Minister;

V. J. Macklin, General Director, Office of Economics Branch.

Hugh Charles Douglas, Deputy Industrial Research Adviser;

R. K. Brown, Deputy (Scientific) Office of Science and Technology;

D. G. Boxall, Scientific Consultant—Materials, Office of Science and Technology;

(*A curriculum vitae of each witness follows these Minutes.*)

The following are printed as Appendices:

No. 53. Brief submitted by the Department of Industry, Trade & Commerce.

No. 54. Brief submitted by the Department of Public Works.

No. 55. Brief submitted by the Emergency Measures Organization.

No. 56. Brief submitted by the Dominion Coal Board.

No. 57. Brief submitted by the Library of Parliament.

No. 58. Brief submitted by the Public Archives of Canada.

No. 59. Brief submitted by the St. Lawrence Seaway Authority.

At 12.45 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Boxall, D. G. Born October 22, 1921 at Sheffield, England. Graduated from the Honours School of Metallurgy, University of Sheffield in 1942. From 1942-46 was with Power Jets (R&D) Ltd. as a development metallurgist. Came to Canada in 1947 and after brief stays with A. V. Roe (Canada) Ltd. and the British Columbia Research Council, joined the Department of Mines and Technical Surveys in 1949, and seconded to the Chalk River Nuclear Laboratories of NRC. In 1955 joined the Civilian Atomic Power Dept. of Canadian General Electric becoming Manager of Materials Engineering. In 1967 left C. G. E. to become scientific consultant—materials, with the Office of Science and Technology, Department of Industry, Trade and Commerce. Member of American Institute of Mining, Metallurgical and Petroleum Engineers, American Society for Metals, and Ontario Association of Professional Engineers.

Brown, R. Keith. M.A. Mathematics and Physics, University of British Columbia. 1942-48 Lecturer in the Physics Department, UBC, responsible for the organization of laboratory work and instruction of a pre radar radio course given to RCAF radio technicians by the university. 1948-49 Assistant Research Physicist, B.C. Research Council, responsible for contract industrial research projects with firms mainly in the Vancouver area. 1950-51 Radiation Physicist at B.C. Cancer Institute. 1951-58 Defence Research Board, participation in and later supervision of the work of a small group (scientists, engineers and technicians) responsible (in co-operation with an industrial contractor) for the design, development and testing of an airborne, doppler navigation radar. This device is now in use in the RCAF, United States military aircraft and several of the world wide commercial airlines. 1959-64 Section Head, Satellite Instrumentation Section, Defence Research Board, responsible for the organizing, direction and supervision of a group of scientists, engineers and technicians carrying out the design, development, construction, testing, launching and operation of the artificial earth satellite Alouette 1. 1964-65, Chief, Government Telecommunications Planning, Department of Transport. 1965 to present, Deputy, Scientific, Office of Science and Technology, responsible for supervision and direction of a group of senior scientific and engineering consultants. Member of Institute of Electrical and Electronics Engineers, the Ontario Association of Professional Engineers and the Canadian Association of Physicists.

Douglas, Hugh Charles, Deputy Industrial Research Adviser, Department of Industry, Trade & Commerce Ottawa, Canada: Mr. Douglas is a native of Ottawa, Ontario, where he received his elementary and secondary school education. In 1946, he graduated from Queen's University, Kingston, Ontario, with a Bachelor of Science Degree in Mechanical Engineering. Subsequently, in 1953, he undertook post graduate studies in Business Administration at the University of Western Ontario. Following university graduation Mr. Douglas worked for a short time at Fairchild Aircraft of Canada Limited, Longueuil, P.Q. From 1946 to 1953 he was employed as an Aeronautical Engineer by AVRO Aircraft of Canada Limited at Malton, Ontario, where he was in charge of the Aircraft Performance and Flight-test Divisions during the design and development of the C-102 jet transport aircraft and the CF-100

fighter, and the preliminary design of the CF-105 fighter, and the preliminary design of the CF-105 Arrow supersonic fighter. In 1954, Mr. Douglas joined the Department of Defence Production, Aircraft Branch, and was subsequently appointed Chief of the Division responsible for the development and production of Aircraft, Aircraft Engines and Guided Missiles. From 1960 to 1963, he was attached to the Canadian Embassy at Bonn, Germany, and represented the Department of Defence Production and the Canadian Commercial Corporation in Germany and several other European countries. In 1964, Mr. Douglas transferred to the Department of Industry as Deputy Industrial Research Advisor, which position he continues to hold in the Department of Industry, Trade and Commerce. Mr. Douglas is a member of the Engineering Institute of Canada, the Association of Professional Engineers of the Province of Ontario, and the Canadian Aeronautics and Space Institute.

Macklin, V. J.: Born in Grande Prairie, Alberta in November 1917, attended public and high school in Grande Prairie and graduated with a B.A. (Honours in Economics) degree from the University of Alberta in 1939. Joined the federal service in 1939 first with the Department of Agriculture and subsequently was employed in the Department of Munitions and Supply, the Department of National Defence, the National War Labour Board, the Western Labour Board and the Department of Reconstruction and Supply. Transferred in 1949 to the Department of Trade and Commerce where he became Director, Economics Branch in 1951, and General Director, Office of Economics in 1967. Presently holds this same position in the new Department of Industry, Trade and Commerce.

Mundy, David B., who was appointed Assistant Deputy Minister, Department of Industry in October, 1963, was born in Edmonton, Alberta in 1919. He was educated at the University of Alberta from which he graduated in 1940 with a Bachelor of Commerce degree. Upon graduation, he joined the Canadian Army and served from 1940 to 1945 in England, France, Belgium, Holland and Germany, retiring from the service in 1945 with the rank of Captain. From 1945 to 1951, Mr. Mundy served in the Trade Commissioner Service of the Department of Trade and Commerce and occupied posts at Liverpool and Stockholm. For the year 1950 he was loaned to the Department of Fisheries to conduct an economic study and initiate a new project. In 1951 Mr. Mundy joined the Department of Defence Production and from 1952 to 1954 he served in Paris with the Canadian Delegation to the North Atlantic Treaty Organization. Mr. Mundy returned to Ottawa in 1954 to be Director of the Armament Branch of the Department of Defence Production. In 1956 he became Director of the Electronics Branch, and in November, 1962 he was appointed Assistant Deputy Minister of the Department of Defence Production. He was also appointed Assistant Deputy Minister of the Department of Industry and served in both capacities until October 1968. An extensive government reorganization of industry-oriented department took place during the summer and fall of 1968, and Mr. Mundy was appointed Assistant Deputy Minister (External Services) in a new department of Industry, Trade and Commerce. His present duties include responsibility for the Canadian Trade Commissioner Service, and International Defence Industry programs.

Warren, Jack Hamilton, appointed Deputy Minister effective April 1, 1969 of the newly-formed Department of Industry, Trade and Commerce, was born

in 1921 near Chatham, Ontario, and graduated from Queen's University, Kingston, in 1941, with a B.A. degree. Mr. Warren served as Deputy Minister of the former Department of Trade and Commerce from September 1964 until his present appointment. He joined the Department of External Affairs in 1945, and in 1948 was posted to the Office of the High Commissioner for Canada in London. Mr. Warren returned to Ottawa in November 1951, and was transferred to the Department of Finance in 1954. He was posted to the Canadian Embassy in Washington as Financial Counsellor, and was also appointed Alternate Executive Director for Canada to the International Monetary Fund and International Bank for Reconstruction and Development. On returning to the Department of External Affairs in 1957, he was posted to the Permanent Delegation of Canada to NATO and the Organization for European Economic Co-operation, with special responsibility for European regional economic developments. In September 1958, Mr. Warren was appointed Assistant Deputy Minister of Trade and Commerce. Mr. Warren has represented Canada at many international conferences concerned with trade and economic affairs. In September 1960, he was elected Chairman of the Council of Representatives of the General Agreement on Tariffs and Trade, and was Deputy Chairman of the Canadian Delegation to the GATT Tariff Conference, held in Geneva, Switzerland, in 1960 and 1961. He was Chairman of the Contracting Parties of GATT from 1962 to 1965. Mr. Warren is Chairman of the Board of Directors, Export Credits Insurance Corporation, a Director of the Industrial Development Bank and a Director of Canadian Patents and Development Limited. He is a member of the Canadian Government Specifications Board, the National Design Council, the General Adjustment Assistance Board, the Automotive Adjustment Assistance Board, and the Machinery and Equipment Advisory Board. During the Second World War, he served with the Royal Canadian Navy as an executive officer. He is married and has four children.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, April 30, 1969

The Special Senate Committee on Science met this day at 10:00 a.m.

Senator Maurice Lamontagne (*Chairman*) in the chair.

The Chairman: Honourable senators, this is our last meeting for phase 2 of our inquiry. We have now finished hearing the agencies of government interested directly or indirectly in research and development. When we meet in the middle of May we will start the last phase of our inquiry and we will begin receiving representations from the private sector.

To end this second phase, this morning we have with us very important people, the representatives of the Department of Industry, Trade and Commerce, a department which is mainly responsible for stimulating and encouraging industrial research in Canada. I am sure that we will have a most interesting discussion about the various programs which have been initiated in recent years to encourage that kind of research and development.

Representing the department are Mr. Warren, the Deputy Minister; Mr. Mundy, Assistant Deputy Minister; Mr. Brown, Deputy, Scientific, Office of Science and Technology; Mr. Douglas, Deputy, Industrial Research Adviser, and Mr. Macklin, Director, Economics Branch of the department.

And so, without any further introduction, I will ask Mr. Warren to give us his opening remarks and then we will have the usual question period.

Mr. Jack Hamilton Warren, Deputy Minister, Department of Industry, Trade and Commerce: Merci M. President, it is a pleasure for myself and my colleagues to have the opportunity to appear before this committee of the Senate and we appreciate the occasion.

Honourable Senators, I should, perhaps, explain that Dr. Orr, who was Scientific

Adviser to the department has taken up a foreign appointment and pending appointment of his successor, Mr. Brown and Mr. Douglas are sharing the responsibility of leadership for our Office of Science and Technology.

Honourable Senators, it is a pleasure, as I have said, for the Department of Industry, Trade and Commerce, to present our submission to this Special Committee on Science Policy. I do not intend to take up your time discussing the department's submission in detail, however, I should like to summarize, briefly for you, our role, as we see it, in this field and to give you some idea of our thinking about the future.

The objectives of the Department of Industry, Trade and Commerce are set forth in The Government Organization Act 1969 which states, in part, that the minister shall promote the establishment, growth and efficiency of manufacturing and processing industries in Canada, contribute to the sound development and productivity of Canadian industry generally and foster the expansion of Canadian trade.

Duties of the minister which are of particular relevance to the work of this committee provide that he shall develop and carry out such programs and projects as may be appropriate to: (a) assist manufacturing and processing industries to adapt to changes in technology and to changing conditions in domestic and export markets, (b) assist manufacturing and processing industries to develop their unrealized potential, to rationalize and restructure their productive facilities and corporate organizations and to cope with exceptional problems of adjustment, and (c) promote and assist product and process development and increased productivity, the greater use of research, the application of advanced technology and modern management techniques, the modernization of equipment, the utilization of improved industrial design and the development and application of sound industrial standards in Canada and in world trade.

It is our conviction that the achievement of these objectives for our secondary industry, can best be accomplished by an integrated approach to the complex of factors bearing on growth rather than by treating in relative isolation the different elements, including research and development, which make up the innovative and adjustment process so important to Canada's industrial development, trade expansion and future prosperity. The merger of the Departments of Industry and of Trade and Commerce will, it is hoped, enable us to accord balanced treatment to the many related problems and opportunities of the mandate given to us by Parliament. The blend of skills now available in the new department provides competence and knowledge in the many disciplines involved in the total process so that the programs I am about to describe will be operated in an organization which takes account of the interactions among all the factors involved, including of course science and technology. The organization chart of the department which is before you, in our submission, illustrates the way in which we are structured to perform our tasks.

A growing mass of evidence indicates that a major element in meeting the objectives I have outlined for our manufacturing and processing industries and our trades is the effective exploitation of science and technology. Recent studies indicate that increases in productivity resulting to a great extent from new technology, have been a major factor in the spectacular economic growth which has occurred in the United States over the past 50 years. Comparative studies indicate that Canada has devoted less resources to research and development, which is such a key factor in innovation and growth, than many of the industrialized countries. In 1965, the latest year for which statistics are available, total Canadian expenditures on scientific research and development amounted to \$682 million or 1.3% of the Gross National Product. This is low by comparison with such nations as the United States—3.4%, the United Kingdom—2.3%, the Netherlands—1.9%, or Japan—1.5%.

Many authorities in Canada, over the past few years, have urged that more Government sponsored development activity should take place in Canadian industry. More recently, we have made an analysis of Government R & D expenditures in industry, in relation to the Gross National Product, and these figures are available in table form for distribution. The figures do not permit a break-out between research and development, but it can

be assumed in this case that the vast majority of these expenditures are of a development nature. Unfortunately, as can be seen from this table, we have not been gaining ground with respect to the level of Government expenditures in Canadian industry for this purpose in relation to our Gross National Product. You will note that the existing programs of the Department of Industry, Trade and Commerce are large contributors.

A feature of scientific activity in Canada warrants comment from the viewpoint of the work of this Department. While we have in Canada a record of in-house university and government research of which we can be proud, this effort does not seem to have been matched by a comparable effort through industrial research and development and related innovative activities to improve our product mix and otherwise secure the potential economic benefits for our country. This becomes evident, when considering that, of the total national research, development and innovation effort Canadian industry performs only 42% by comparison with 66% for the United States, 67% for Great Britain, or 65% for Japanese industry.

Part of the explanation no doubt lies in the subsidiary-parent relationship of many of our manufacturing companies which has enabled Canadian industry to import rather than create much of our modern technology. However, this is by no means the whole answer. Environmental factors, both those established by government and those present in industry, have also been very important. I believe that in Canada, both at the Government and industrial level, we have been slow to recognize how rapidly changing technology was influencing production and consumption patterns and how important it was and is for Canada fully to participate in the innovative process if our country was not to fall behind as a major industrial and trading nation. Happily, there has in recent years been a growing recognition of this phenomenon and priorities are being adjusted accordingly. But much remains to be done both by industry and government.

In the Department of Industry a number of important programmes were developed and set in operation to encourage industry to increase its development and innovative activity by means of financial incentives. Many specific activities of the Department of Industry and of the new Department are also oriented in this important direction.

We have set up and are administering five programmes which provide financial incentives for industrial research, development and innovation activity. I shall describe each of these briefly.

First the *Program for the Advancement of Industrial Technology known as PAIT*.

This programme was set up to promote the growth of efficient, competitive manufacturing and processing industries in Canada. It provides risk capital for development and innovative projects which appear likely to lead to a marketable product or a new or improved process. The Crown shares the risk and the company making the proposal is expected under current PAIT regulations to repay the Crown share if the project is successful.

The Second is the *Defence Industry Productivity Program known as DIP*.

The immediate objective of this programme is to develop and sustain the technological capability of Canadian industry for the purpose of defence export sales or civil export sales arising from that capability.

The programme is aimed at those companies or elements thereof which have or may develop a defence-oriented capability employing advanced management engineering and technology directed to defence export sales or related civil export sales.

The Third is the *Industrial Research and Development Incentives Act known as IRDIA*.

This programme, set up by Act of Parliament, unlike the first two, is not project oriented. It is a general incentive conceived to provide an overall stimulus to industrial research, development and innovation. Canadian firms are not required to receive authorization before undertaking the work but may at the completion of each financial year submit an application for a grant based on their research, development and innovative activity during the year. This grant amounts to 25% of eligible capital investment in scientific, research and development facilities and 25% of the increase in current research and development expenditures over the average of the previous five years.

The Fourth programme is the *Building Equipment Accessories and Material Program known as BEAM*.

The objective of the BEAM programme is to increase productivity and efficiency in the manufacture and use of building equipment, accessories, and materials. Much of the mass

of available information and technology is not readily available to the different elements in the industry. To help rectify this situation the Department has taken the initiative in consultation with industry in designing an information system for the dissemination of information pertinent to building equipment, accessories and material.

And Fifth, the *Industrial Research Institutes Program*.

It is the view of this department that Canada has much to gain from a closer liaison than now exists between industry and educational institutions—particularly universities and technical institutes. This programme provides grants to universities to help cover administrative expenses of institutes they establish to work with industry and in particular to undertake, on a contract basis, scientific research activity for industrial firms unable to maintain their own research facilities and personnel. It is hoped that this programme will, on the one hand, assist the universities to improve their understanding of the problems of industry and, on the other hand, help industry to become acquainted with the latest pertinent scientific and technological developments.

Details of these five programmes and their administration are covered in Appendices M to Q in the brief you have before you.

In addition to these specific programmes the Department undertakes a variety of other activities many of which are oriented towards the application of science and technology in industry. The following are examples: (1) We carry on continuing studies and analyses of the scientific and technical policies of other Government Departments and agencies and of Governments of other countries so that we may be well aware of the possible impact of these policies on Canadian industry, and ensure that we do not overlook programmes and techniques used by other countries which might be appropriate to the Canadian scene.

(2) We have initiated on a continuing basis a series of techno-economic surveys of sectors of industry. These studies will provide the department with important guidance as to the potential of each industry sector, and the state of technology within an industry. We hope that the surveys will reveal the priority which the industry should attach to research and development, possible areas and appropriate methods of support, and the degree of support which may be warranted.

(3) *Technological Forecasting*: While technological forecasting cannot be exact because

of the unpredictable nature of innovation and invention, a systematic attempt to forecast technological trends is now recognized as being a necessary part of industrial development planning. The department plans to develop this technique and to make it available in advising and assisting industry.

(4) *Scientific and Technical Information Services*: The Department has taken a strong interest in and has provided considerable assistance to the study undertaken by the Science Council of Canada on this subject. We expect to continue strong activity in this area both to provide the necessary information services within the department and to ensure that Canadian industry is properly served by any national system which may evolve.

As can be seen from the foregoing the department has laid the groundwork for a wide range of scientific and technological activities. Much useful work is under way and a series of government assists to industry have been developed and applied. But it is clear from what is happening in the competitive world around us, from the accelerating rate of technological change and from the comparative figures I mentioned earlier that both in industry and government we must do more to sustain and advance our position. And the effort must be of a scope and duration and effectiveness to achieve the objectives established and approved.

I believe there is a strong case to be made for improved and more adequate incentives to encourage Canadian industry to change established patterns of operation, to introduce new marketable products and to specialize and rationalize. I consider that in looking at the various government programmes to assist industry in its research and in the application of new technology we should have in mind the whole of the product cycle leading through research and development to pre-production, production and marketing. From the trade and industrial point of view it is the end result of new marketable products which is most important. As in golf, the follow through is what completes a good swing and gets the ball straight up the fairway. We are looking at all our programmes and, in cooperation with them, the related programmes of other agencies such as the National Research Council and the Defence Research Board from this point of view.

In developing innovative projects and programmes with industry, the opportunities are great and so sometimes are the risks, but we believe this risk-taking to be worthwhile. We

have learned from past experience that failures in projects are less likely to be technical failures than management failures. For this reason we place great stress on analyzing proposals from industry against the long-term plans of the company, and we look for a demonstrated ability to carry the process through to the final stage, which is the sale of the product on a profitable basis.

As members of this committee will realize, there are two types of departmental programmes to help industry increase the level of research and development activity. One is the statutory type of programme in which we attempt to create an environment more conducive to a generally higher level of research and development activity, and the other is the specific project-oriented form of assistance where the firm is required to meet very precisely defined objectives. We believe that a mix of both types is necessary, but what is required at this stage is probably more emphasis on the project-oriented type of assistance.

As our work in the new department proceeds we will expect to bring forward necessary changes to existing programmes and possibly new programmes for government approval calculated to assist and speed up the innovative process in Canada and so move towards fuller and more rapid achievements of our departmental objectives. Our experience in handling existing programmes, including the administrative controls designed to ensure programme integrity, financial soundness and continuous monitoring of achievement in relation to objectives will, I trust, ensure that the resources which the government may be willing to place at our disposal will be well applied. We hope to develop a balanced range of incentives and other assistance which will both sustain and encourage product development generally and selectively encourage developments of particular priority for the economy where partnership between industry and government may be the essential key to breaking through to new and higher ground in technology and production.

Thank you, M. President and Honourable senators, for the opportunity to make this presentation.

The Chairman: Thank you very much.

Senator Cameron expressed an interest in initiating discussion this morning, but because of . . .

Senator Grosart: Technological problems.

The Chairman: Yes. He has been unable to be with us this morning so that, at the last minute, our staff asked Senator Grosart to pitch in.

Senator Grosart: Thank you, Mr. Chairman.

First of all I think I am sure we all wish the new department, if I may call it that, very great success in the big job it has ahead of it. This is one of several reorganizations in this particular area of industry, trade and commerce, all obviously tending towards a more sophisticated and efficient machine to perform the very necessary government function of upgrading the level of research and technological development, and innovation in Canada, and I am sure we wish you very great success in that.

I wonder if, just to set the picture in some kind of a context, you would update the broad figures indicating the input of R. & D. into industry in Canada. The last figures we have are the O.E.C.D. figures in the now famous Orr Report. I think you said he is leaving you and going elsewhere in the foreign service.

Mr. Warren: Yes, he will be the Scientific Advisor and Senior Officer in charge of scientific and technological activities in the Canadian High Commission in London, England.

Senator Grosart: Will he be seconded by your department?

Mr. Warren: He is under the jurisdiction of the Department of External Affairs, as I recall the administrative arrangements that have been made, but his posting has been worked out in consultation with the Science Secretary, External Affairs, ourselves and other departments such as N.R.C.

Senator Grosart: I am sure he will be very valuable in that new posting. On our behalf please wish him success.

Mr. Warren: Thank you, sir.

Senator Grosart: We all recall, I think, that in this report to the Science Council, of 1967, the general effect was to indicate that of the nine selected countries for comparison, Canada was at the bottom of the list in terms of percentage of G. N. P. input into industrial R. & D. both by performance sector and source of funds. You have given us a table this morning which refers, as I read it, only to

federal government funding so there is not an immediate comparison here.

May I ask you if there has been any noticeable improvement since four or five years ago which is really the effective date of the Orr figures in the R. & D. component either of industries' own funding or in performance?

Are we any better off than we were when the rather discouraging O.E.C.D. report came out?

Mr. Warren: I wonder if I could ask Mr. Douglas, who worked on the original report and the updating of it, which I believe to be done on a two year basis, if he would respond to Senator Grosart's question?

Hugh Charles Douglas, Deputy Industrial Research Adviser: Mr. Chairman, I think, as you are aware, looking at the document before you, the Dominion Bureau of Statistics released preliminary information on their 1967 survey of industrial research and development just last Friday.

Senator Grosart: Yes.

Mr. Douglas: This gives us some indication of the expenditures which have been made by industry as a performer in that year in comparison with the 1965 data which was included in the report of Dr. Orr. Unfortunately we do not have a figure for the total research and development expenditures in Canada but I think that from what we know of federal government expenditures and what is revealed about the industrial research and expenditures in this daily bulletin of last Friday we can say that the picture in terms of expenditures as a percentage of gross national product, or of industrial expenditures in terms of a net output or, value added, has not changed substantially since 1965.

The Chairman: In terms of research activity, but in terms of the financial contribution to such activity?

Mr. Douglas: Well—

The Chairman: Would it be true to say that industry tends to finance a greater proportion of its own research activities and government less than in 1965 according to these reports?

Senator Grosart: Well, do we have any figures showing industry funding of its own R. & D.?

Mr. Douglas: Yes, we have.

Senator Grosart: Current?

The Chairman: For 1967?

Mr. Douglas: For 1967. These are the figures that were published just last Friday, sir, and it shows that the total expenditures by industry in 1967 had increased by 9.7% over 1966 and that the 1966 increase was 12.5% over 1965.

Now, these rates of growth are somewhat less than the rates which were experienced in the years 1963 to 1965 when the average rate of increase in expenditures for research and development in industry was of the order of about 24%.

Senator Grosart: The average rate of increase?

Mr. Douglas: The annual rate of increase was about 24%.

Now, you mentioned the question of expenditures financed by industries. In 1965, I think I have the figures here...

Senator Grosart: It is 31%.

The Chairman: They say here, in this publication, that in 1965 industry financed 71% of its intra-mural R. & D. compared with 77% in 1967.

Senator Grosart: Mr. Chairman, we seem to be far apart on figures. The table I have here, which is gross national expenditures on R & D (this is Dr. Orr's Report) shows industry as a source of total funds for R. & D. as 31% in 1965.

The Chairman: This is the total.

Senator Grosart: That is what I am concerned with. I am concerned with the total. This is the only way we can get a picture as to whether there is any improvement. It is important what the sources of funds were and the changes in the relative percentages of the sources of funds, but my question is related to the total picture.

The Chairman: In order not to be confused, Senator Grosart, the figures I just gave were only for the industrial sector and they say here that in 1965, 71% of research done in industry was financed by industry.

Senator Bourget: Mr. Chairman, does it include the grants or subsidies given by different departments?

The Chairman: No, that is contributions by industry, 71% in 1965, 77% in 1967, that is only for industry.

Senator Grosart: This checks out with another table I have here which is the one dated November 11th, 1968, prepared, I imagine, by Dr. Orr as Industrial Research Adviser as I think he was at that time. This is a public document and it shows the 1967-1968 figure for federal government expenditures as 26% in the industrial sector so this would about check out with your figure.

I will have to admit I am a little confused here. What I would like is a current comparative figure to the figure of 31% which was industry expenditure on R. & D. as a percentage of GERD Gross National Expenditure on R. & D.).

Mr. Douglas: No, we do not have revised figures for the total gross expenditure on research and development.

Senator Grosart: Would you say this figure of 31%—again I stress it is industry's total contribution to R. & D.—is up or down?

Mr. Douglas: As a source of funds?

Senator Grosart: As a source of funds?

Mr. Douglas: I would think it has not changed substantially, that would be my estimate.

Senator Grosart: That is, in a way discouraging and perhaps this can lead on to my second question which concerns the fact that I think we can all recognize that straight, raw comparisons between countries may not always be valid. Canada may be a particular case, particularly in view of the availability of our R. & D. through subsidiaries and so on. Would you care to comment on that? Should we compare our figures numerically or should we make qualifications? If we should make qualifications then what qualifications should we make?

Mr. Warren: I think, Senator Grosart, we should try to get hold of whatever information is available. You know the work that Dr. Orr has done, and which has been used by the O.E.C.D., I think needs to be updated. I think that in making judgments there are some qualitative elements that you want to put in. Certainly there are benefits that flow to Canada from the import of technology, but in terms of the innovative process and the end of the product cycle of marketing, goods from Canada and new goods that are competitive internationally, I think it is very important we do focus also on the amount that is being done in Canada because it is the

work that is being done in Canada that is most likely to give us a product which will be marketed internationally and which will not simply be an image of a product produced elsewhere by a parent company.

Senator Grosart: I am very glad to hear you make that observation, sir, because I think it is a very, very important one. Again, I keep referring to Dr. Orr, but he is the source of most of the reading material I have been able to find. This is the thesis that he developed quite strongly in the "Tripartite Chemical Engineering Conference" an article, which appeared in *Industrial Canada*. He makes this very point, we must innovate in Canada to get that extra time-jump in the selling of the product that comes out of the innovation. I am a little disturbed that your department does not have these figures more precisely for this reason. There is an assumption here, in your incentive programmes, the three big ones, civil and defence, that there needs to be a further input of R. & D. into Canadian industry.

The question I would ask is; have you any scientific support for this assumption, which is really the basis of the whole departmental program. Why do you say we should have more?

Mr. Warren: Because, sir, of the very rapid change in the product mix that is going into consumption and use throughout the world in the decades we have been living through and projected into the decades ahead. The pattern of goods moving is changing very rapidly. Many of the goods that are now used by companies and purchased by consumers were just not on the market 10-15 years ago. In world trade terms you find that the greatest growth in world trade now is coming between developed countries, between manufacturing countries, because of the great specialization of use of equipment and source materials and inputs. This is where the growth is to a greater degree than in the trade and materials and we have to, if we wish to maintain our position as a leading industrialized nation, have some of that new product as well as old product to offer to our own consumers and in world markets.

Just to revert to the earlier part of your comment, sir, I don't look at the business of home grown innovation and development nor imported technology as complete alternatives. I think we have to use both, take the benefit of the imported technology where it is the appropriate input and build on it and build

our own so we get the double advantage in our world competitive position. When I say, "world competitive position" I am referring to the competition in our market from imports as well as our possibility of penetrating world markets, particularly for our manufactured goods, now, in addition to our materials with new products that can win markets.

The Chairman: Just supplementary here, if in the process we are too severe or too strict in insisting that these innovations or this development work should lead to improvement in Canada primarily. In certain cases this might discourage research in Canada though.

Mr. Warren: I am afraid, Mr. President, I do not follow you.

The Chairman: Because of that rigidity that you may have in certain of your programmes. If these firms, doing the research in Canada, are not allowed to exploit the technology then the research work may not be done because of the parent and subsidiary relationship.

Mr. Warren: We endeavour, in our programmes, to make sure that the actual research and development is done in Canada and we wish to encourage the companies to get the benefit of that work for Canada through production in Canada which increases our employment and our package of goods for sale domestically and for export.

There is provision, as I understand it, in the PAIT programme for certain exceptions to be made where something cannot be economically justified for production in Canada, but I think it would be questionable whether, *ab initio*, in a programme we should be using the public funds to finance research and development and innovation in Canada without a control that would tend to make sure that the benefit comes to Canada and which could simply mean that the result of that R. & D. and innovation was exploited from another country.

Senator Bourget: Then what are your recommendations to improve the growth here in production? Is it through the creation of production research connected with universities as recommended by Dr. Orr?

Mr. Warren: Our feeling, sir, is that more should be done in the industries themselves so that the result of the research and development ends up in a marketable product. We would like to see a bias in government thinking towards more work done by the compa-

nies related to the whole product cycle, not simply for research and development's sake.

Senator Belisle: Could I ask a supplementary question?

You mentioned, Mr. Warren, that your department gives grants to universities to further studies in order to assist industry. How is the selection made regarding universities?

The Chairman: That is not supplementary.

Senator Belisle: What criteria are used to determine which university shall be assisted first in the technical field or a line of industry?

Mr. Warren: Perhaps, Mr. Brown, you would speak to our work with universities, particularly the programme that has been oriented to the development of the research institutes by universities that were willing to work with industry and provide service to industry.

The Chairman: Will you allow me, at this stage, to interrupt? Could you postpone this question please?

Senator Belisle: Yes.

Senator Grosart: Your chart on page 25 (the organization chart of the department) seems to indicate, on first glance, a down-grading of the Office of Science and Technology. Is this just a graphic misconception? When I read the responsibilities of the O.S.T. it seems to be much more important than to be put away down on your chart. Does this office participate at the management level?

Mr. Warren: In the Management Committee this office is not directly represented, but it is represented by the Senior Assistant Deputy Minister responsible for the whole of industrial and trade development activities in the department, Mr. Kniewasser. I think the chart, which you have on page 25, tends to give a visual distortion of the importance attached to the industrial and trade function of the department. This function includes industrial development inputs, export oriented inputs, and scientific and technological inputs and our external services abroad. It is a very central part of the activities of the integrated department and in our normal displays this whole block of functions is up at the top in line with the Assistant Deputy Minister—Industrial and Trade Policy, and the other senior echelons of the department. It was our

view, since the objective of the department has to do with efficiency and growth of Canadian industry and trade, that the input from research and development and scientific and technological activities was most appropriately cited within the industrial and trade development function. I again refer you to the notion of the product cycle with work aimed at an integrated effort leading to the end result of new products, greater productivity and growth for Canada. So, in our view, these scientific and technological activities are properly positioned close to these elements of the departments which are working on industrial and trade development.

Senator Grosart: And yet it would seem to have the policy responsibilities. For example, in Appendix C, Page 32, it has the job of advising with respect to national science policy. My first question actually would be; Who would you find to advise in the present circumstances on national science policy?

Mr. Warren: Perhaps I should take that question very carefully, Senator Grosart.

Senator Grosart: Well, there are some good answers.

Mr. Warren: I could reply in this way.

The Chairman: You are always careful.

Mr. Warren: We need to have, and it has been recognized from the beginning of the Department of Industry, in our work and input into the total scientific activities of the government, we have to be able to play into that process the needs, as we are able to identify them, in industry. We have to have links with that total scientific work of the government. But, importantly from our point of view, in relation to the objective of the expansion of our growth and prosperity and our trade, we use this office for that linkage, and we have the expertise in that office. I do not think that we pretend to have any unique responsibility for science policy in Canada.

Senator Grosart: No, you merely say, "to advise with respect to—", and I take it that you are using science policy in a rather more restricted way than we might be inclined to use it in this committee, I accept that.

Mr. Warren: That is what worried me about your question.

Senator Grosart: There seems to have been developed over the years a rather surprising imbalance between federal funding of R. & D.

in the civil sector the defence sector. You have given us some figures here, totals, for example of the PAIT programme. I accept the fact, of course, that PAIT and IRDIA are new whereas DIP has been operating for some years. However, if we look at Page 47 we see the total Crown commitments to date on PAIT are \$23 million, on IRDIA, perhaps \$5 million, then if we jump over to Page 72...

The Chairman: You have them all on this table, Senator.

Senator Grosart: Well, I did my homework on this table and I prefer to stay with the one which I used for my homework. I come up with a figure of \$148 million in the defence sector. Would you care to comment on this. I think it is obviously an historic fact, are you going to continue to put this much stress on the funding of R. & D. in defence as against the civil sector?

Mr. Warren: I would ask Mr. David Mundy, the Assistant Deputy Minister of External Services who is responsible for the DIP programme to explain. I simply observe, by way of introduction, I think the figure of \$148 million you mentioned probably includes something in excess of \$50 million for years when the DIP programme was operative before the other programmes were involving expenditures.

Senator Grosart: Perhaps even more than that.

David B. Mundy, Assistant Deputy Minister: Well, Senator Grosart, I think your point is well taken. I think we recognize, in the Department of Industry, Trade and Commerce, that from the long term point of view we want to increase the emphasis of the activity of the department with respect to support of industry for civil oriented projects. I think I should point out though, that in the long run there is really not that much more Canadian government expenditure which is devoted to defence activity now as compared with, for instance, 1958-1959. If you will refer to the table, which was issued this morning, you will note that in 1958-1959 the Department of National Defence had a \$47,500,000. programme which was really...

Senator Grosart: Excuse me, would you mind identifying that because I am not familiar with it.

Mr. Mundy: Yes, sir, it is this table.

Senator Grosart: Yes.

Mr. Mundy: And if you refer to the left-hand side, "1958-'59", you will see that under the first group there, Department of National Defence is \$47,500,000. which is virtually the sole contributor, as you will see from the bottom figures, to expenditures in industry.

Now, this was the year of the Avro Arrow cancellation.

Senator Grosart: I thought we would come to that.

The Chairman: It did not come from me.

Mr. Mundy: You will notice what happened to defence expenditures in the immediate following years and you will also notice, in the last year in which we have figures, that it is still only at the \$13,100,000. level. So I think that if one takes a look at the long term one will see that the emphasis on total government expenditure on defence in industry has really not risen. However, recognizing this, we have taken a number of new initiatives in the Department of Industry, Trade and Commerce and its predecessor, the Department of Industry, and you will see that whereas there was a defence assistance programme started up in 1959-1960 and following into the three subsequent years, it was really the only programme of assistance to industry in that time period. We have now expanded from 1961-1962 on into a number of other programmes with a great deal of emphasis, on the civil sector.

A further point I would make is that one year ago we altered the defence industry productivity programme so that it can include projects which employ defence technology but which are utilized for civil export sales opportunities. We have established, as a target, despite the fact that the Treasury Board doesn't give us any more money, that we will have a portfolio of projects within that programme which are about 50% civil oriented and about 50% defence. So we take your point, sir and we are trying to meet it.

In addition to that, as the Deputy has indicated, we are undertaking studies at the present moment with the view to coming forward with new initiatives and the emphasis, of course, will be in the civil sector.

Senator Grosart: Yes, and of course the history of technological developments since the war has indicated that there is a very high degree of spinoff into the civil sector

from defence spending. Has that happened in Canada?

Mr. Mundy: Yes, sir. I think this point is also a very good point. We have to recognize that in the aero space and electronics industry that the new knowledge, the new technology, by and large, comes through the defence route. The same technology today will be, five years or ten years from now, common in the civil products of that industry. So, it is most important that we keep up to date in the new technology, but it is also important that we exploit it for civil opportunities.

Senator Grosart: You show about one billion dollars in sales which can be directly tied to this \$148 million expenditure. This is not the highest ratio in the world, but under the circumstances probably a pretty good one. Could you indicate some of the projects where there has been spinoff of your figure of 78 successful projects?

Mr. Mundy: Yes, sir.

Senator Grosart: Give us a few illustrations.

Mr. Mundy: Well, I think if I just take them at random I would include as outstanding projects, which got their technology through the defence, route, the family of VSTOL aircraft which De Havilland is engaged in. As you probably know, the latest and perhaps most successful member of that family is the Twin Otter, which happens also to use another programme, the PT6 which is a United Aircraft engine, a completely new gas turbine engine, which was developed through assistance from the government and a large company input which was basically defence technology but now also has turned out to be an engine in which about 50% of the sales are going into the civil market and in which we predict even more emphasis will be on the civil side.

Another example is the Doppler Navigation Equipment in which Marconi has probably the main industrial input and in this area there have been a number, although it is primarily defence sales to start with, there have been a number of sales to civil airlines.

Perhaps even more dramatic is flight simulators. The technology on flight simulation and particularly the advanced technology in digital flight simulators has come again through the defence route where the first requirement was and where we had some of our own national defence requirements. Now,

the company, Canadian Aviation Electronics, has been extremely successful in recent years in obtaining a world reputation for digital flight simulators for a whole family of commercial aircraft sold to Europe and the U.S. market and we regard these as outstanding examples of the spinoff of civil sales from defence technology.

The Chairman: Outside the aviation field, do you have other examples?

Mr. Mundy: Yes, I think we have a number of examples of what you might call the more pedestrian type of thing where we have developed metal components for instance and a capability which now is providing quite a back-up to these companies in their general portfolio of civil sales. Now, this capability is not in the normal research and development sense. It is a technological capability of advanced production methods and it is proving extremely useful for these companies in their civil sales, but has been sparked by the fact that in order to get a defence contract you usually had to have tape controlled machine tools and the advent of this new production technology has enabled them to increase their civil sales.

Senator Grosart: I don't want to get into the counter mortar radar business particularly but in that connection the question was raised as to whether it was the best way to go about marketing the innovations in Canadian industry by giving your department virtually the whole responsibility for marketing. D.R.B. (the Defence Research Board), indicated that maybe they might have done a better job of selling some of these things than you.

Mr. Mundy: I had not heard that.

Senator Grosart: I am not saying this is so, I merely am raising the whole question, the policy question, of the marketing responsibility which is, after all, the end target of your departmental activities. It is so that you have almost a total responsibility there.

Mr. Mundy: Well, sir, I think that it is true that we can get a high degree of support from purely military agencies such as D.R.B., Department of National Defence, the Armed Forces, and they have been extremely co-operative and it has been a matter of government policy to insure that we do marshal all our resources of the government because this is what our competition is doing, in order to make these particular sales. I think it is true, however, to say that the lead probably has to

be taken by the people who have some really good marketing expertise and we have an organization known as the International Defence Programs Branch which has a market research group, a market planning group and also has a number of representatives who are stationed in the United States and with our other NATO allies who are responsible for knowing as much as possible about the upcoming requirements of foreign countries and for negotiating international agreements of completely informal or perhaps of a formal nature to insure that the environment for Canadian industry is a good one when they have something to sell.

Now, the fact that a number of people have referred to the counter mortar radar as being a failure, I think merely indicates that in this business you are operating in high risk areas. There is a marketing risk quite often which is unknown, but you have to take your losses with your successes. In fact sometimes I think that we have not had enough losses which may indicate that we have not been taking enough risks in the process. The degree of failures we have had in the programme has been remarkably small. Some people might argue we should have been taking greater risks.

Mr. Warren: Senator Grosart, on your general point of marketing, I think the merger of the two predecessor departments into the single Department of Industry, Trade and Commerce, brings together in one department most of the skills that exist in the Canadian government with respect to foreign marketing and negotiation of access to foreign markets. We regard the marketing activity as very much part of the total product cycle.

Senator Grosart: I can see this fitting in with your facilities and your trade commissioners and so on.

The Chairman: One last question for the time being, if you don't mind.

Senator Grosart: I was just going to say that I have a good many other questions, but would just like to ask one.

The Chairman: If we want, I assume that we can spend the whole day with you.

Mr. Warren: We are entirely at your disposition, Mr. Chairman.

Senator Grosart: My question refers to the input of technological information into Canadian industry. It is referred to several

times in your brief as one of the responsibilities you undertake. I would be interested in knowing what facilities and capabilities you have for doing a good job here. I don't need to stress the importance of it. I know you are fully aware of it. The question would be: Who goes to get technological innovation information? How do you find it? How do you process it? How do you bring it in? How do you store it? How do you retrieve it?

Mr. R. K. Brown, Deputy, Scientific, Office of Science and Technology: I can comment on this, Senator Grosart. If you are thinking in terms of day to day input to an industry, particularly to the technical engineering people, who may want to get their hands on the very latest information on technology, such a system as I think you are envisaging, a central or a nationwide system which would enable any industry in Canada to get rapidly at this sort of information does not exist.

I am sure you are aware that there has been a very large study, just completed, started under the Science Secretariat, and completed under the auspices of the Science Council on Scientific and Technical Information and I am sure you are also aware this was fostered initially by our department. We were enthusiastic to see this sort of thing done and we have provided one man, full time, and one man, part time, throughout this whole study. In fact, the man leading this study is from the Department of Industry originally.

Senator Grosart: Excuse me, perhaps I can narrow your answer. These studies seem to relate more to the earlier stages, the research and early applied stages. What I am concerned with mostly in this question is the innovation stage, the sort of thing the Japanese did with the transistor. What I am really concerned with is that obviously the average Canadian firm just has not the facilities to do what the Japanese did, extend themselves all over the world and so on, but my question really relates to the thesis of Dr. Orr, in that article, where he says it is not price in the world market any more, it is that early jump on innovation.

Mr. Brown: If I may just finish the little bit on information?

Senator Grosart: Yes.

Mr. Brown: I would hope the emphasis on a national system, this of course is up to much further discussion, would be heavily on just what you are looking for because while the system is not perfect, the scientists, doing their initial research, have at least a worka-

ble system now, and what is completely lacking is a rapid information system not completely lacking because some industries do have their own, for the working engineer who is ready to innovate, who is building his background just at this stage. I think this would be a contribution there. It is not the only one, of course. There is no simple, single answer to this. Our industrial research institutes, which I am going to mention later, are a very small, I think maybe an effective assistance here in that some of these innovations are at the finger tips of people in universities and for a small Canadian industry particularly we hope to see a steady flow, and there have already been some evidences of such, but to insure that Canadian industry takes advantage of every possibility and technical innovations is going to require an attack on all fronts.

Our programmes, Mr. Mundy has been talking about, are one of our major efforts because we do just that. We support the innovation. If we have contacts with innovations within the department which we think apply to Canadian industry we have a complete, whole group, sub-group organizations, the operations branches to see that they get this information. They are continually visiting industries.

Mr. Warren: Mr. Mundy may want to add a comment on the defence side, but very briefly at the present state of the art we have our Office of Science and Technology trying to monitor what is happening in the world outside Canada as well as inside Canada. We have them doing a little technological forecasting. So far as the dissemination of information is concerned, where there are breakthroughs which may change the real economic base of industry, our line branches which comprise commodity officers who know that particular industry, are in constant touch with the industry directly through seminars and through publications etc. The Branches do what they can; but that, I would say, is a poor substitute for a proper information system for scientific and technological information such as could be envisaged for Canada.

Senator Grosart: Your missions abroad, this would be one of the functions of this approach?

Mr. Warren: I would say that the missions abroad are not really so equipped, with the possible exception of the International Defence Programs Branch which is working

in this area of new technology in the defence production areas of different countries with which we have relationships. These people are able to get skilled scientific and analytical information back on innovation. That would also be true of the scientific liaison office of our High Commission in London. At this stage your average Trade Commissioner would not be programmed for this work and might not, at this stage, have the skills.

Senator Grosart: I am sorry, I was referring to the missions you send abroad.

Mr. Warren: The industrial development missions we send abroad, of which there are a number listed here, are to have a good look at what happens elsewhere to see if there are any lessons to be learned by Canadians.

The Chairman: While our efforts in this field seem to be relatively small, it seems to me we are in danger of confusion in this kind of activity in your department as compared with the responsibilities that the Science Secretariat is supposed to have in the international field.

Senator Grosart: And everybody else.

The Chairman: And everybody else. But, I was just beginning with the Science Secretariat.

Mr. Warren: We start with the particular mission of the department which is industry and trade oriented so there is a selectivity to our work in this area which I hope complements and is complementary to the intelligence abroad which the Science Secretariat may do.

The Chairman: Are you in contact with them? Do you know what they are doing? They have, I understand, an overall responsibility in this field.

Mr. Warren: I would be very disappointed if my office were not. Mr. Douglas, your office is in touch with the Science Secretariat?

Mr. Douglas: We are indeed.

Senator Bourget: Have you got a committee of the departments?

Mr. Warren: There are a number of inter-departmental committees.

The Chairman: On international relations?

Mr. Warren: Well, I think that perhaps there are two different things that we are

discussing here. With regard to our position on international organizations on scientific activities, the Science Secretariat takes the lead and any participation that we have in such activities is under their leadership on straight scientific activities and science policies; but I think that these missions we are talking about, these industrial missions, are just not for scientific purposes. They are broadly industrial missions to acquaint different sectors of industry with what is going on abroad in their area of interest, not only in the technological sense, but in marketing, production, financing, in every sense.

Senator Grosart: But, you have to know the product first.

Mr. Warren: Perhaps Mr. Mundy could say a word on this.

The Chairman: But apart from the missions, I understand that the missions have a very specific purpose, then I don't think the danger of confusion is very great there unless there are three or four different agencies and three or four missions for the same purpose. I do not think there is a great danger in this.

Apart from this, for the general functions and general relations with the rest of the world, we are told that the N.R.C., for instance, is conducting a lot of activities in this field, that the Science Secretariat has been given the overall responsibility so far as our relations with other countries are concerned, and then you have responsibilities too, and where is this being co-ordinated so that each agency would compliment each other?

Mr. Brown: I could make a comment here.

Mr. Warren: I will try a general comment first, Mr. Chairman.

Perhaps, at the expense of repeating myself, as I understand it, where it is generally scientific, intelligence for scientific purposes, the N.R.C. has a great historical position and the Science Secretariat is co-ordinating it. Again, I would like to repeat that our interest would be in innovations and developments that affect industrial growth and have an application to our mission. So I think that would narrow down what you feel is a large area of overlap.

The Chairman: Well, the Science Secretariat has a large responsibility too. They have, if I remember well, they told us that they were responsible also to try to fore-

cast the implications of technological development on our society and in order to do that I presume they would have their own service of technological forecasting. Are you not trying to do, more or less, the same thing for your own purposes? At what stage are these activities co-ordinated?

Mr. Warren: I think at the stage when they sort out their work tasks in the inter-departmental consultations.

Mr. Mundy: I wonder whether you could enlighten us in this area.

Mr. Mundy: Well, Mr. Chairman, the question raised by Senator Grosart about access to world technology is vital to our whole economic picture and is something of great importance, naturally, as a result of this. I think the point is, that the peculiar environmental features which hold in Canada of geography and economics and politics give us some special access to the fount of most advanced world technology which, of course, is the United States. Most of this technology resides in industry, but it also resides in government establishments as well and it is, of course, absolutely essential that we play our cards right to ensure that we take advantage of this particular environmental feature which is extremely beneficial to our economic development. I think that we have escaped, as a result of being able to take advantage of these circumstances the outcry which there is in Europe about the technological gap with the U.S.A. at least we have escaped it so far and we have got to make sure we continue to escape it.

Senator Grosart: "Defy les Americaines".

Mr. Mundy: The effort which we undertake has many facets in it. We have a special relationship with the Americans in the defence field, but we have also a special relationship in the general industrial field because of the parent-subsidiary type of set up which generally prevails between Canadian industry and United States industry and we negotiated agreements at the government level which will give us access to this technology.

For instance, we have an arrangement called a memorandum of understanding on research and development with the United States Armed Forces. This means that those giant and extensive laboratories in the United States, with their tremendous resources that pour out advanced technology; where we have a joint programme, are available to us

for the basic technology. We are able, when we enter into joint programmes with the United States, to build on that technology, this basic technology, and develop specialized capabilities in some particular sphere.

Another example in the purely civil area is that, as you are well aware, a major effort in Canada in recent years, has been to obtain sub-contracting from the big United States airframe producers and the technology which we acquire there is from the parent company, not necessarily to a subsidiary in Canada, but also to a sub-contractor who may be in a completely different corporate set up. What we find there is that the production techniques, for instance, new welding techniques which they have in the United States; that we gain access to these basic techniques by reason of exercising a sub-contract relationship with a United States parent for advanced products of the aero space industry.

So, I think it is true, Senator Grosart, that we are aware of the problem, the importance of it and of working at many levels within government and industry to ensure that we do keep ourselves up to scratch in technology in those areas where our industry has specialized.

Senator Robichaud: Mr. Chairman, I notice from Pages 82 to 89 we have a list of major projects funded or performed by the department under the PAIT programme and also under the DIP development incentive programme. Now, we have a list up to December 31, 1968, and going through this list I find that under PAIT we have listed 150 projects and of those only 4 have been undertaken in the Atlantic Provinces. Under the DIP development incentive programme, where we have 58 projects, 5 have been undertaken in the Atlantic Provinces. Now, could we have any comment as to why there should be such a trend?

Mr. Warren: I think, Senator Robichaud, that this reflects the fact that at the present the concentration in many of our companies' activities in Canada is in central Canada.

Senator Robichaud: Well, are there no requests coming in from the Atlantic Provinces, no industries are asking for this type of assistance?

Mr. Warren: Well, to the extent that they ask and their proposals are eligible, they are served; but I think it is inevitable, in looking across the spectrum in Canada, that those requests will be less from areas where there is less industry.

Senator Robichaud: I can well understand they would be less but when they only represent approximately 2½% of the total it seems to me that there must be a reason for it besides the point that industries are centralized in central Canada, Quebec and Ontario, but is this type of assistance publicized, is it made known to different areas?

Mr. Warren: Yes, sir.

Senator Grosart: Mr. Chairman, could I perhaps ask a supplementary question? In the old Industry Act, there was a responsibility, I think it was in Part 2 of the Act, for area development, is that a responsibility of the new department or has that gone over too?

Mr. Warren: The responsibility is that of the Ministry of Regional Economic Expansion.

Senator Grosart: So along the line of questioning that Senator Robichaud is taking, you have really turned this responsibility over to another department which brings up the whole question again of co-ordination. Surely regional development must still be one of the criteria in your decisions. How important a criterion is it at your level?

Mr. Warren: Well, one of the answers is that the government has established a department which concentrates the different facilities we have to deal with the problems of regional disparity in Canada. Part 2 of the answer is, of course, it does not mean in the department we ignore this problem. Indeed, I could assure you that as a matter of policy in administering these programmes we are out looking for candidate industries in the less developed regions of Canada to help and see if we can encourage them either to take part in the programme or to equip themselves to take part in the programme; but the basic facts would remain, I think, that even with such efforts, the mass of your expenditure is going to relate to central Canada until much greater progress than at present has been accomplished in overcoming regional disparities.

Senator Robichaud: I think Senator Grosart has touched part of my second question which was related to your statement on Page 12 where you describe the organizational functions of the department and you mention, "The effectiveness of the government's activities in the areas of science and technology as they relate to industrial development would be improved through greater co-ordination of the various programs involved."

Now, are you referring to programmes undertaken by the department or by different departments of the government or projects undertaken by the industry proper?

Mr. Warren: We are referring there, sir, to programmes administered by other agencies where we think...

The Chairman: But all related to research and development?

Mr. Warren: All related to the broad cycle that I have mentioned, for example, the programmes of the National Research Council and Defence Research Board, where we think maximum co-ordination, within the different areas of specialization, is extremely desirable. We believe, of course, in very, very exact co-ordination within the department amongst its own programmes and it is part of our normal vetting of a project to know whether that company in that connection has taken advantage of any other government programme.

Senator Robichaud: As a follow-up then of your chart, on Page 25, you mention different branches of the department. You have given a food branch, which is naturally related to a federal department such as Fisheries and Agriculture. Could you give us a brief description of the co-ordination that exists between the Department of Industry, Trade and Commerce and those two departments?

Mr. Warren: Well, our mandate, Senator Robichaud, is particularly for the manufacturing and processing industries, the trade of Canada generally, and tourism in Canada. Conceptually you could think of the work of departments like Agriculture and Forestry carrying on the production up to the stage where it entered into the manufacturing or processing point in the spectrum of upgrading of our production and it is there that our people take over. In the Agriculture, Fisheries and Food Products Branch particularly, we are concerned so far as industrial development is involved with processing and manufacture, but we are concerned with the whole of the process from the raw material up so far as trade is involved since we may sell both fish and processed fish products.

Now, there is a very close liaison at the working level between the Branch and the relevant elements, in this case, of the Department of Agriculture or of the Department of Fisheries, both on product development and marketing and trade policy.

Senator Robichaud: Do you have continuous, existing inter-departmental committees?

Mr. Warren: Sometimes inter-departmental committees, more frequently it is done on a day to day routine to be in touch with other departments. If there is a particular project, you might set up a committee for it. The day to day relationship is a good liaison with the departments.

The Chairman: I am sorry, before going to the Senator I had forgotten Senator Belisle.

Senator Belisle: It is obvious that my honourable colleagues did their homework last night. They are asking very intelligent questions. I have done my own work on the poverty committee for to-morrow morning.

The Chairman: You raised a question?

Senator Belisle: There is no rush for it. Sometime this afternoon. Just go ahead.

Senator Bourget: I am in the same position, Mr. Chairman. My questions have either been asked by either Senator Robichaud or Senator Grosart. I would like to ask Mr. Warren; what do you think of the effectiveness of *Gaugman's Incentives To Industry* having to do with research? Do you think that up to now they are adequate or could they be changed? Could they be improved?

Mr. Warren: I would hope that they could be improved and this flows from our basic recognition of the priority that has to be given to innovation if we are to maintain our position as a manufacturing nation and a trading nation. It flows from the figures I mentioned in my statement. It suggests we are not doing as much as other countries. It flows from what I would regard as the normal, proper administrative practice of continuing to review programmes to see where they may have had strengths or weaknesses and to build on those strengths. It is part of my thesis that the government should be doing more by way of incentives to help industry to help itself.

Senator Bourget: According to Dr. Orr's Paper, in the conference that he gives to the Engineering Institute of Canada, he seems to imply there is too much research done today. Could you comment on this?

The Chairman: In industry do you mean or in government or in general?

Senator Bourget: Research in general.

Mr. Warren: Well, simply to turn the question over, sir, I believe that more should be done to make sure that the benefits of research, pure and applied, are carried through to the end of the betterment of our economy so that I would urge that more be done in the area of industrial research.

Senator Bourget: Are you the one to recommend to the government the establishment of those research institutes to which Dr. Orr made reference in this paper?

Mr. Warren: Yes—

Senator Bourget: I feel, myself, it is a very good recommendation. I would like to have your views on that.

Mr. Warren: This is one of our programmes.

Senator Bourget: So far you have spent only \$40,000 to three or four universities.

The Chairman: I think that Mr. Douglas has new figures. I think the figure you have just quoted is wrong.

Senator Bourget: Well, it was printed there and I am taking what I have read.

Mr. Douglas: Thank you, Mr. Chairman. There have been grants awarded to four universities so far to assist them in establishing industrial research institutes and the total amount of these grants is \$500,000. These grants are paid in annual or semi-annual instalments over an initial period of normally 3 years. To date expenditures are \$230,000, so just about half of the total grants have been paid.

Senator Bourget: Were there other universities, other than those four mentioned in Dr. Orr's papers?

Mr. Douglas: Well, I don't recall.

Senator Bourget: There were three, I think, in Ontario, and one in Nova Scotia.

Mr. Douglas: There is the University of Windsor.

Senator Bourget: Yes.

Mr. Douglas: The Nova Scotia Technical College.

Senator Bourget: Yes.

Mr. Douglas: McMaster University and the University of Waterloo. Those are the four.

Senator Bourget: There are no others?

Mr. Douglas: We are in discussions with a number of universities, but no others have come forward yet for assistance under the programme.

Mr. Warren: This discussion covers universities in many parts of the country.

Mr. Douglas: Yes indeed.

Mr. Brown: The point was made, and it has not been answered; How do we select these universities? If I may go back for just a minute into the history of this?

The Chairman: I am interested in Windsor.

Mr. Warren: Paul Martin?

The Chairman: That is what I thought.

Mr. Brown: The programme was initiated within the department in early response to proposals by several universities of which one was Windsor, and another was McMaster, and still another was the Nova Scotia Technical College. That is, either the Department of Engineering, or, the President of each of these universities has the kernel of this idea in his mind, or, a somewhat similar approach and he would approach us and we undertook a number of lengthy discussions and the result was this programme, which is only a small programme. One has to take this problem carefully because the prime responsibility of universities is teaching, not contract work for industry, but we did feel there was a lot of expertise in university that should be made available to industry, near the university particularly, and so the prime objective of these institutes is that the universities shall first serve industry locally. As Mr. Douglas has pointed out four are in operation, and it was an experiment. We were unsure whether it would turn out well or run into trouble so we wanted to play it at a low key until we had a look at them. But, we were unable to keep it at a low key because the word got around to a number of universities who inquired. So we have now informed, not rigorously, every university in Canada, but we have certainly made certain that any university with an effective engineering and science department knows the details and possibilities and we have left it at that. We have not attempted to do a hard sell on this. We have left them to come to us. As Mr. Douglas has pointed out, we have had inquiries from universities in Quebec, the Western Provinces, in addition to the four that were

mentioned. None of those inquiries have jelled yet, but I think at least two or three of them will do so in the next year or two.

Senator Bourget: How is the cost shared between the university in that case and industry and the help they get from your department?

Mr. Brown: Our department provides only administrative and overhead costs. That is, the salaries of the director, assistant director, and other officers associated with overhead, clerical help and travel. The terms of reference of the institutes require that when they do work for industry it be done on a contract basis where the industry pays the whole cost of the research except, of course, they are operating in an organization whose overhead is, in part, covered by our operation.

Senator Belisle: Mr. Chairman, seeing you were concerned as to the location of Windsor, and Senator Martin, I should say that someone should have done more. I, as Chairman of the Board, have not got too much to report but I am satisfied with the answer.

The Chairman: Senator Bourget?

Senator Bourget: Some of my questions have been answered.

The Chairman: If you want to come back we have plenty of time today.

Senator Carter?

Senator Carter: Thank you, Mr. Chairman. Before I start my own question I would really like to ask a supplementary question based on the line of questioning opened up by Senator Grosart and Senator Robichaud.

Senator Grosart referred to your organization chart on Page 25 and the apparent down-grading of the Office of Science and Technology. Now, I remember when the new Department of Industry was set up in 1963, and when the government telephone directory came out it seemed that the Department of Industry was set up along parallel lines with the Department of Trade and Commerce and practically duplicating the same branches, certainly with the same titles if not the same duties. Now, I have been wondering what has happened since these two have been brought together into one department. Has there been any reduction of personnel?

Mr. Warren: Yes, senator. I am afraid I have not brought the exact figures of savings but I think it was of the order of 80 or 90

positions that were saved. Of particular interest, I think to you, following your line of questioning, is the functions of those so-called line branches, the ones that deal with the chemical industry, machine industry, and so on, have been combined so that in the one place the two functions that were separately performed can be brought into proper relationship, the function of industrial development and the function of helping in the export markets.

The Chairman: Can you tell us who won in the process of negotiation?

Mr. Warren: I don't think there was any question of winning, Mr. President. I think that the economics of the situation probably dictated the desirability of putting these two functions of government together. If you think of a company that is endeavouring to develop a new line of production or to market products that it has not marketed before, conceptually in a world where tariff barriers are coming down and where the important thing is to be internationally competitive, that is competitive against imports, competitive in third markets where you have to get the volume of production that allows you to get the economy of scale to be competitive internationally, then you have to think about markets going beyond Canada when you are thinking about your broad development plan. So your industrial development and marketing functions have to be considered together in developing a sound proposal for moving forward. I think the integration of the two ministries permits this. It also means a businessman coming to Ottawa with his problems, which he sees from the company point of view, has fewer doors to knock on to talk about both industrial development and trade development and he has a place where he can be directed to the other areas of government where he may have problems to discuss. Then the third element, of course, is the saving in your administrative overheads in having a single department. So I think these are three of the things that may well have been in the government's mind in deciding to put the departments together.

The Chairman: How many Assistant Deputy Ministers are there in the Department?

Mr. Warren: There is one Senior Assistant Deputy Minister and two other Assistant Deputy Ministers, Mr. Kniewasser, Mr. Schwarzmann, Mr. Mundy.

The Chairman: How many of those were from the former Department of Industry and

from the former Department of Trade and Commerce?

Mr. Warren: Mr. Mundy came from the Department of Industry. Mr. Schwarzmann came from the Department of Trade and Commerce as did Mr. Kniewasser.

Mr. Bourgei: Mr. Warren, you have established the Standards Council of Canada and the BEAM programme; don't you think those two projects are duplicating the work done by the National Research Council? They also look into that kind of standards and also the construction of houses.

Mr. Warren: With respect, I don't think so, Senator. The proposal for a national Standards Council of Canada, which is not yet before the House, would bring together in one place in Canada, in the Standards Council, all those interested in standardization activities of which the National Research Council is only one, the Government Specifications Board another, the Gas Association of Canada another, and importantly, the Canadian Standards Association. The interest of the provinces and municipal authorities and the academic community in standards are also involved and the Council should allow an integrated approach to this very important area of work, which relates so importantly to industrial efficiency. If you have disparate standards you are going to have smaller runs of product and less capacity to sell across the country. The same thing is true of international trade where it is very, very important that international standards that may be set take into account Canadian standards and *vice versa*. So, the Standards Council, I feel, is a major new operation to bring these interests together and to provide an integrated approach here and into the international sphere of Canadian interest in standards. But the BEAM programme has been developed really to try and move that industry forward to a higher level of technology. It is not only the information system that is being developed for the construction industry. We are also trying to sell concepts of modular components, to have interchangeability in building procedures and components throughout the country and work on the National Housing Code. All this is designed to gain a greater productiveness and efficiency from the construction industry as a whole which, as you know, is made up of many, many companies spread throughout the country. The N.R.C. had inputs into the technical work on wood products, but we are trying to deal here with

the construction industry as a whole, the whole efficiency of the building process in Canada.

Senator Grosart: Has the Canadian Standards Council been set up yet?

Mr. Warren: No, sir.

Senator Grosart: Is it on the immediate horizon?

Mr. Warren: Yes, sir.

Senator Grosart: That may be a political question.

The Chairman: Do you have a supplementary question, Senator Bourgei?

Senator Bourgei: I cannot see very much difference between your programme and the work that is now being done by the National Research Council regarding housing.

Mr. Warren: May I ask if Mr. Boxall, one of our officers, could clarify the distinction?

Mr. D. G. Boxall (Scientific Consultant—Materials, Office of Science and Technology Department of Industry, Trade and Commerce): I might say a few words on that, Senator. Looking at it on a technical plane, we have the big difference between the BEAM programme and the work done by the National Research Council. It is the difference between the component and the system. The National Research Council, in its laboratories, does a great deal of extremely valuable work in the former. For instance, to pull out something at random, N.R.C. has been extremely active in the development of good insulating windows and in methods of heat insulation. That though, however, is only part. Before you can get this window or this system of insulation into a house or an office building cheaply, you have to look at the whole system of house building, and this is where the BEAM programme takes over. There is nothing really new in systems building, if you look at the components, what is new, is taking together the parts, as it were, the windows, the beams, the furnaces, which have been developed, not just by N.R.C., but by other organizations and welding them into a system which the contractor can use.

Perhaps you might say, I don't know if the parallel is an awfully good one, you might say that the N.R.C., if you like, is the builder of the cars or aircraft and that the BEAM programme is a system of transportation. In other words, cars have no use without roads,

traffic lights, and how you weld them into a whole. Does that help to answer your question, Senator?

Senator Bourget: Yes, it does, but do you work closely with the N.R.C.?

Mr. Boxall: Yes the Department does. I am not myself, too closely connected with the BEAM programme, but I will attempt to speak for them. The N.R.C., particularly the building research division, is represented on the committees and there was a most successful conference under the BEAM programme in Ottawa about a year ago which was actually a reverse trade mission, and I might digress for a few seconds here. This was a very valuable instance of how the department brings information to industry. I think there were 400 or 500 people present. It was a conference and the department brought to Canada, from the United Kingdom, from the Netherlands, from France, from Sweden; architects, engineers and successful contractors from the businessman's viewpoint and presented it to the Canadian industry. I may say, that at that conference the building and research people of N.R.C. took part both as speakers on the programme and had a very active part in the formulation of planning that went into it.

Senator Bourget: Thank you.

Mr. Warren: Senator, I am advised that the N.R.C. element concerned was very, very closely associated with the development of the BEAM programme and there is a very close working relationship. We are here acting as the catalyst to give industrial application to the most modern technology.

The Chairman: Thank you, very much. Senator Carter?

Senator Carter: I am still on the organization chart, Page 25. Now, I think Senator Robichaud had raised a question about agriculture and fisheries and in your reply you said that your responsibilities were more with the manufacturing industries.

Mr. Warren: So far as industrial development, but no so far as trade is concerned where we cover the whole spectrum.

Senator Carter: Well, every industry, it seems to me, has a number of problems which affect all sorts of various things. For example we have had technical problems, we have had economic problems, there are transportation problems, particularly the wheat

industry; transportation problems, sales problems, productivity problems, and the same would apply to the fisheries and the ship building industry. I am wondering, it seems to me that somewhere in the government structure there should be somebody or some group who would be charged with looking at the problem, the whole problem, from all its angles instead of—I know you have inter-departmental committees which bring together different angles, but that does not appear to me to be good enough. It would also seem to me that the logical place where that group should be charged with this overall responsibility, is somewhere in your department, but I don't see any provision for it. I am wondering, first, does it exist elsewhere in some other government structure, or, if not, don't you think it would be a good thing if we had that?

Mr. Warren: Senator Carter, to the extent that a place exists where the problems of an industry are looked at as a whole, I think it would be not unfair to the other departments to say that it is precisely in these industrial line branches that are listed across the bottom of the chart on Page 25 and where a great proportion of the manpower of the Department of Industry, Trade and Commerce is concentrated. I outlined to you the legal position of the responsibility of the department which concentrates on manufacturing and processing, but we conceive of our mandate as embracing the welfare of the particular industry generally so that our people in thinking about a processing development or manufacturing development do not close their minds to the economics of the raw material input and they work closely with other departments in that. But, they comprehend, in their thinking about the well being of an industry, all the elements that go into it, but some of those elements may not be under our control. To take an example, supposing, hypothetically, you wanted to grow some new grades of grain in the western economy. Well, the control of the seeds that can be used in our prairie economy is vested in the Department of Agriculture and its agencies but that wouldn't prevent our people talking to the agriculture people about it.

Senator Grosart: That is what happened in the rapeseed case, almost an exact case, isn't it?

Mr. Warren: To carry your thinking further, if I may, and without disrespect, I think it might be hazardous to envisage a govern-

ment structure composed of a hundred departments each one of which was in charge of a particular industry.

Senator Grosart: I am not saying that they are supposed to be in charge. I suppose, within the overall set up there would be somebody who would be keeping an eye on the individual industry. I am thinking about the one group or branch that would be always looking at it as a whole. Let me illustrate by asking you a question. Let us take the ship building industry. Canada is a maritime country. We are a fishing country. All over the world, especially in the under developed areas, there is a tremendous expansion. They are short of protein. Who is looking at the fishing industry to see where Canada can expand the ship building industry to supply these people with ships, fishing equipment, things like that? Who, in your department, or anywhere is keeping an eye open for opportunities?

Mr. Warren: The Aerospace and Marine Branch is looking at precisely those things as well as administering the subsidy programme.

Senator Carter: The Aerospace and Marine Branch of your department?

Mr. Warren: Yes.

Senator Carter: Now, at the bottom of page 2 of your brief, you state that the Department of Industry has engaged in a wide range of study and analysis of engineering technology and economics. Have you carried out any studies to find the impact of federal taxation on productivity generally and particularly as it applies to the electronics industry and the computer industry?

Mr. Warren: I don't think so, sir. We do not have with us this morning people from the Electrical and Electronics branch, but if I can give you a general reply it is that, as I have indicated in my previous reply, in these industry branches the officers concerned are looking at the whole spectrum of elements that affect the well being of an industry. Now, that would include, from their point of view, although they would not be the element in the government as a whole that would have the control, the elements of taxation involved. For example, supposing you are looking at a given industry and you find that at the present level of tariffs, for example, the cost of the inputs of that industry seem to be a disadvantage to that industry, and if, after you have checked that out against your

general economic analysis and your trade policy people, you will discover there is some advantage, perhaps, in reducing those costs. Then it is quite conceivable that we, in the Department of Industry, Trade and Commerce, would go to the Department of Finance and ask them to consider a rebate, for example, on the tariff on those component parts or similarly that something would be identified about the administration of the customs where we would approach National Revenue, but not simply because an industry had made a representation to us because we are the business department but because careful analysis had suggested to us in the totality of our look at the industry and the total responsibility that the case may warrant intervention with another department.

Senator Carter: Well, I am not sure whether you have made a survey on the electronics industry or computer industry. Have you made a study of the impact of taxation on these industries?

Mr. Warren: We have certainly studied both these industries very carefully. What I am nervous about doing is assuring you, sir, that we have made a particular study of the impact of taxation on those industries.

Senator Carter: That is what I am getting at. Have you made a study of the impact of taxation on any industry?

Mr. Warren: My answer is that the taxation impact is one of the factors we take into account in examining the position, relative, of all the industries.

Senator Grosart: Supplementary to Senator Carter's question: Has there been any study, that you know of, of the relative effectiveness of cash incentives or grant incentives as against tax rebate incentives?

Mr. Warren: It is a question that is very often discussed in industry as you know.

Mr. Mundy: Well, if I may just speak briefly on that, Mr. Chairman. Under the predecessor programme it was originally envisaged that it be a tax incentive. However, I believe that as a result of various studies which were undertaken it was felt it would be more equitable to convert this into a straight, outright grant so that those companies which were not in the happy position of having enough gross profit against which to charge expenses for R. & D. would also be able to take advantage of this particular gov-

ernment incentive as well as the ones that did have this profit position. So that was the reason in that instance of converting a taxation incentive into an outright subsidy.

Senator Grosart: This seems to have been a major policy decision and I am wondering whether any of these studies are available.

Mr. Warren: I wasn't in the department at the time.

Were the studies uniquely made in our department or were they views that were developed also in the Treasury?

Mr. Douglas: And the Department of Finance.

Senator Grosart: It would be very interesting to see those because industry seems to like the tax incentive approach and yet I can see the inequities that can very easily develop.

The Chairman: It seems to me, in this field, there are all kinds of potential inequities. If you give a grant to a particular company and then it makes a profit out of this, then it is another particular manifestation of inequity.

Senator Grosart: But industry often asks, for example, that all legitimate R. & D. expenditures be corporate tax exempt.

Mr. Warren: It is already a proper cost chargeable against their taxation. It enters into cost in the normal way. What the programme does is add a grant.

Senator Grosart: I would say it enters in a rather abnormal way from my experience with the Income Tax Department.

The Chairman: I wonder if some of you have looked at the evidence that has been before us which was presented by Mr. Mackenzie, former Deputy Minister of Trade and Commerce, and was a member of the subcommittee of the Economic Council on these incentives, and he came out very, very strongly, although he is now, I presume, very objective, being retired from his former company.

Senator Grosart: He will never be objective.

The Chairman: He was certainly very much in favour of the tax incentive formula.

Senator Grosart: Sometimes it is said that our government and others are getting grant-happy.

Mr. Dougals: I think, if I may make a comment here, Mr. Chairman, the grant formula was favoured by the Carter Commission and in the course of our—

The Chairman: And the tax formula by the Economic Council.

Mr. Douglas: The Economic Council's committee, yes. We examined, very carefully, the briefs, submissions and information that had been provided to the Carter Commission in considering this question. The report of the commission had not been published at the time, but we had access to their briefs and to the evidence that they took on this point.

Senator Grosart: I wonder, Mr. Chairman, if it would be too much to ask Mr. Warren to prepare a memorandum on the views of the department on these two conflicting theories. I make this suggestion to you, not to him, as to whether this would not be a very valuable piece of paper for us to have.

The Chairman: Well, if they don't want to do it for us perhaps we will have to do it ourselves.

Senator Grosart: No, but we have the evidence here now that studies have been made and one of the complaints some of us have from time to time about the announcement of government policy is that we are not always told the components that went into that policy so we are inclined to be critical when we are not perhaps always correct.

The Chairman: I was just giving the alternative so they might prefer, at the end, to do it themselves rather than having us do it.

Senator Grosart: I leave it in your hands.

Mr. Warren: My hesitation in replying, Mr. Chairman, is there is a question in my mind, as a Deputy Minister, as to whether the question and the submission made by Senator Grosart does not bear on government policy as a whole including that of the Minister of Finance.

The Chairman: I think that we might postpone this.

Mr. Warren: What I might offer is a couple of comments, at this stage, if it would be of interest to the committee.

Senator Grosart: Certainly, yes.

Mr. Warren: As I understand, one of the inputs into the thinking of the government in this connection was if assistance is given to

particular groups, companies, et cetera, through the taxation system, it is rather less identifiable to the House of Commons when the estimates of departments are presented than if that assistance is clearly identified and related to the object of the programme, which systems of grants, which can be mathematically equivalent to what might be available to companies through taxation, were used. From the point of view of our department, as I mentioned in my opening comments, we think in terms of our industrial development, of the need for rather more specialization in Canada, rather more selectivity of objectives, and this tends to lead you to the project approach, an approach which allows you to sit down with the company and agree on objectives that relate to their interests, and the interests of the country as a whole, and allow you, in the provision of your assistance, to work with them to ensure, as I think Mr. Mundy mentioned earlier this morning, that the company concerned has the capability, management-wise, financial-wise, marketing-wise, to carry through in the case of many of our programmes to the point where there will be payoff for the economy and, I think that those are the thoughts that were in my mind in response to your question.

Senator Grosart: In other words, the incentive is more closely tied to action and it is more identified.

The Chairman: And controlled.

Senator Grosart: Yes. And you see the carrot and the donkey a little more clearly.

Mr. Warren: You can see, as legislators what it is that is being done.

Senator Carter: Could I follow up by a question on taxation?

The Chairman: Yes.

Senator Carter: Last year the *Globe and Mail* carried an article by Roger Newman in which he quoted Mr. Roy A. Phillips, President of the Electronics Industry Association of Canada, and Mr. Phillips is quoted as saying this:

Our industry certainly has to do a better job of communicating with the government and the public, Mr. Phillips said recently. Canadians obviously do not realize the industry's value or the government would have removed our discriminatory tax burden. As a result I will spend most of my presidential year try-

ing to improve our techniques of communication, clarifying our story so it is easily understood.

The Chairman: Did he mention the tax problem that they have?

Senator Carter: No, he did not. Well I did not read on but the basis of my question was: In the face of a thing like that, a statement like that from a very important company, a very important industry for Canada, where we can get into outside markets, if we can, surely if a president of a company makes a statement like that somebody would make a rebuttal or would at least make a study of that, of what he was talking about.

Mr. Warren: The Association has been very active, sir, in increasing its communication with the government. It has been up several times to Ottawa to meet both with us and with officials of the Department of Finance to discuss certain aspects which are within the purview of the Minister of Finance, particularly the excise tax on television sets, but it is an area of industry where we have worked very, very closely with the group and I think I am correct in saying that we have been in touch with the Department of Finance in connection with a certain number of their publications.

Senator Carter: I have a number of questions, Mr. Chairman, but if you will permit me one more then I will give somebody else a chance.

This morning Senator Grosart raised the question of technical management innovation and on pages 2 and 3 of your brief you state that that is one of your rules and objectives and that to attain those objectives you have carried out a number of programmes and you go on to say, and I am quoting now:

Most of these programs have aimed at encouraging industry to increase its R. & D. activity and to undertake technical and management innovation;

That is the question that Senator Grossart raised this morning.

Now, Donald A. Schon, writing in the *International Science and Technology*, published an article which was entitled, "The Fear Of Innovation". He said, in effect, that the modern industrial corporation wants new technology and wants new ideas and then he goes on to say, and I am quoting his words:

If it, that is the corporation, believes that technological innovation is essential to

corporate growth, but on the other hand it fears innovation and it tries in various ways to prevent it.

Now, I wonder, in the light of your experience with your programmes and your efforts to promote technical and management innovation, if you would care to comment on this statement and if you find that there is such a problem as described by Mr. Schon, what are you doing about it?

Mr. Warren: I would ask Mr. Mundy and Mr. Douglas to comment, in detail, on your question. If I might make a general comment by way of introduction. It needs to be remembered, I think, for many, many years, Canadian industry was focussed particularly on the protected domestic market together with some special access to commonwealth markets that arose from the Imperial Preference System. With the lowering of tariff barriers to trade that has taken place since the war, there has been much freer access between countries to trade in goods and, as I mentioned earlier, the impact of this has led most people and many thinkers in the companies to realize that for their long term health they have to achieve what I have termed "international competitiveness". Given that the product mix in international trade is changing so rapidly, that means that they must come up to date and develop product lines that can be sold. I would think that in Canadian industry there has been a much greater recognition of this in recent years than in the past years, after the war, and more and more management is recognizing this. But, I don't think that all of management, by any means, has yet recognized that if they are to be healthy and profitable, 5, 10 years ahead, that they have to be working to keep in the forefront of their particular area of production. So I think we would have, in Canada, a not untypical mix for industrialized countries of a number of companies who are thinking ahead, trying to plan their product development for a new market or even creating markets for new products. This is what is happening, but there are companies that are more relaxed and not making the investment in the future.

In response to the second part of your question; we have indicated to you the programs, PAIT, IRDIA, DIP which have been developed and which are available to industry designed precisely to do this, and we hope to resolve this problem and to adopt these programmes and develop new programmes as we go ahead.

Senator Carter: I am not clear from what you said if there is actually a problem, if this fear of innovation is actually a problem. Have you found it to be a problem?

Mr. Warren: I would like now to ask Mr. Mundy and Mr. Douglas to respond on experience in administering the programmes.

Mr. Mundy: Well, Senator Carter, I think it is true to say that there is a certain resistance in industry to technical innovation and new management techniques. I think this is only natural if you are running a company and suddenly you are presented with a problem that to be internationally competitive you have to convert your complete equipment to tape control of machine tools or if you discover that a management consultant's report tells you you have got to reconstruct your whole management, you have to go off on different product lines, that you have to tackle export markets rather than the domestic market, obviously this presents the senior management of the company with a very severe problem. So, I think it is quite natural there would be a certain resistance. However, I believe that in our experience we have had some outstanding examples of a very good response from Canadian industry with a certain amount of leadership and environmental activity being provided by the government. The example which I would give of this is the aero space and electronics industry. We were looking, earlier this morning, in response to Senator Grossart's question about how in 1958-1959 there was \$47 million spent through the Department of National Defence in basically those aero space and electronics industries. Now, this sort of expenditure was related to an environment where they were not internationally competitive. They had allocated contracts to a large extent from the Canadian government. They were on cost plus type of contracts, a great number of them. Now, with the advent of the cancellation of the Avro Arrow the new environment of international competitiveness through production sharing, these companies were suddenly faced with this thing you are talking about. They had to change their way of life. They had to adopt new equipment. They had to become competitive with United States' firms. They had to acquire new technology. They had to acquire new management techniques.

Our view in government is that the response from these industries was really magnificent because you can see that in a space of a relatively short period of time they have

converted themselves to a group of companies whose major effort is in the export market, who are selling competitively, both military and civil products and who are completely at home in an international trading environment. We feel that this has pointed the way to an area of considerable benefit for the long term economic future of Canada in that we have firms now in the high technology industries who have succeeded in doing this. So, I think the answer to your question would be that there have been a number of examples where they have responded well and that co-operation between government and industry has been very beneficial. I could give some examples of how we do co-operate with them in these objectives. For instance, when we lay down the criteria for our programmes of assistance we include some criteria with respect to long term planning. In other words, we say to companies who come forward with R. & D. proposals that we want them to state what their long term plan is, how they are going to reconstruct their company to meet these new environmental factors, and the companies work with us on this in order to adapt themselves to the new modern management techniques.

The Chairman: Have you made any study of the causes, the real causes, of the weakness in industrial research in Canada? We always say, "well, this sector of research is weak because we have so many subsidiaries here in Canada and it is because of the limitation of our domestic market." Do we have a study which has been made, which explains, at least which points out to the main causes of that weakness?

Mr. Warren: Mr. Douglas?

Senator Grosart: Could I ask a question?

The Chairman: Or is it because our industry cannot specialize and cannot develop into bigger enterprises?

Senator Grosart: Just a supplementary question that might also be answered at the same time. Are we sure there is a weakness? Have you a target for the redistribution of funding of R. & D. in Canada as between the main funding and performing sectors? We can come back to this 32 per cent back in 1965. Now, Senator Lamontagne suggested there is a weakness. It has been said there is a weakness. Have you a target?

Mr. Warren: We have not a target, sir, we are sufficiently low and upward movement is

what we are after. We do review our programmes, you know, our list of successes and failures. As I mentioned earlier, we have frequently found the failure was perhaps not on the technical side but the management capacity of companies. But I rather think we do not have as good a crystal ball as you would like us to have, sir.

The Chairman: But, unless you have as clear a picture as possible of the sources of weaknesses, it seems to me that it is very difficult for you to develop the right kind of incentive programmes. Because you may not get at the real source of the weakness if you do not know it. So, I come back to my original question.

Senator Grosart: Yes, both qualitatively and quantitatively.

The Chairman: Not so much quantitatively. We know quite a bit about the quantities but I don't think we can explain yet, at least I have not seen any serious study which explains the weakness of our sector here in Canada as compared to that of the United States, compared to that of Great Britain, because in these two countries, as you know, over 60 per cent of the research is done in industry.

Senator Grosart: But if we look back we see a real problem. Take the Arrow problem, I am sure, Mr. Chairman, that you listened very carefully to the pluses of the Arrow because you might want to revise that chapter in your autobiography.

The Chairman: It won't be more than a footnote.

Senator Grosart: The point here was that suddenly we found ourselves with a very, very large part of the total funding of R. & D. in industry in one particular project and if we look at the chart, we see how government funding in industry drops year after year, so that today we are not back to the level (as a percentage of G.E.R.D.) of government funding in industry when the Arrow was cancelled. Now, we have these various incentive programmes. I am surprised you have not a target. Why not make a post-audit and say, "All right, DIP was supposed to do this, IRDIA was supposed to do this". Has it increased this very important sector of our economy 1, 2, or 3 per cent.

The Chairman: I wanted to go back to this, senator, I wonder if you would allow them to answer my question?

Senator Grosart: I am sorry, I think it is germane to your question, particularly the Arrow part.

The Chairman: Have you made any study of this?

Mr. Douglas: Mr. Chairman, we have not made any comprehensive study of the weaknesses of industry which I think was your question in this area.

The Chairman: Is this due to a managerial gap? Is it due to the fact our firms are too small, is it due to the fact that we have too many subsidiaries? Do you accept the conclusions of the Watkins Report, for instance, that subsidiaries of foreign owned firms in Canada do at least as much research as comparable Canadian firms?

Mr. Douglas: Well, on this latter point, certainly the evidence we have would indicate that their conclusion is right in this regard. A very substantial amount of industrial research and development that is undertaken in this country is undertaken by foreign controlled companies and, of course, this, I think, reflects the fact that a very large proportion of the so-called science based in industry is foreign controlled. So that, as you would expect, they are the ones that are doing the research and development.

The Chairman: If the Watkins Report is right then the fact we have so many subsidiaries here does not explain the weakness of our industrial sector insofar as research and development is concerned because they say that on the whole they are doing more than comparable Canadian firms.

Mr. Douglas: Yes, but I think there are, perhaps, some other factors you have to take into account. First of all there are many firms in the Canadian industry which it is hard to conceive would be able to undertake any independent research development or maintain any independent research and development at all. I think only 10% of the industrial establishment in Canada employ any more than 100 people and about 14% of the firms have less than \$1 million annual sales.

The Chairman: Well, this is exactly what I am getting at; Has there been a study of all these basic weaknesses of the private sector in Canada, because if the real source of weakness is that our firms are too small, I don't think that the kind of programmes you have here now are going to meet that problem.

Mr. Warren: Mr. President, I wonder if I could make a distinction, for the committee, between a definitive study, which I think was the first thought of your questioning, and our ongoing work. Have we yet, or now a book that we can give you that says, "Here are the R. & D. weaknesses of Canadian industry and the reasons therefor.", which we could give to you to study? I think the answer to that is, "No", not as a comprehensive, completed piece of work. But the whole crux of the work of our department in all its aspects has to do with the efficiency and productivity and growth of Canadian industry and we look at that from the point of view of the aggregates as Mr. Macklin does in his economic analysis. We look at it by industry sector and trade policy, and the process of study and evaluation of the strength and weaknesses of our industry is going on all the time.

The Chairman: For instance, would you say there is a managerial gap? We were told this morning there is no technological gap developing in Canada. Would you say that there is a managerial gap developing?

Mr. Warren: My opinion would be that we need considerable improvement in the management, in certain of our companies. In the day and age in which we live I think that management is going to have to be a very, very important part of keeping up with the times.

Senator Grosart: Mr. Chairman, I think that I would say the plans were perhaps to gain access to such studies. We are looking for input in the long run as the committee hearing into national science policy. Over and over again we run up against this problem because people say, "We know all about that. We are talking about it. We have inter-departmental committees." But, we are having great difficulty in this committee finding definitive material. I will give you an example out of our own record. The Science Council made this statement in their brief to us:

The fatigue failure of engineering materials is now the most wide spread and intractable problems of engineering design.

This was their statement. I asked Dr. Schneider:

How much of this research work on many industries should be doing a con-Canada? This seems to be one area where many industries should be doing a continuing job on the subject.

Dr. Schneider referred the question to Mr. Thurston. His answer is this:

The answer is very simple, sir, it is effectively zero.

Now, here is a particular case. We have not heard any more about it but they say this is one of the major problems and an expert from the council says—Canadian industry—"zero".

The Chairman: Well, in any case I don't want to pursue this very much longer. There is no comprehensive study of the Canadian situation and the major sources of weakness.

Now, I see that in 1967-1968 the total amount of grants to encourage industrial research, outside of the defence field and apart from contracts, of course, is about \$13,500,000. The first three programmes are here, on the right column of your table.

Now, while I am sure you agree this is not very big, what is the cause of the relatively small size of that amount? Is that because of lack of funds from the government or is it because you do not receive enough requests or that the requests you receive are not eligible under the specified conditions of your programme?

Mr. Warren: I think that there is quite a lot in the pipeline, sir, that is not reflected in the figures. Perhaps Mr. Douglas would speak to the civil programmes.

Mr. Douglas: Well, I think in general we cannot say it is due to lack of funds. As an overall statement, I think that would be correct. Grants under the Industrial Research and Development Incentives Act are statutory payments, so that we are not concerned with an appropriation for that purpose. On the other programmes we have not, at least in the last few years, run short of funds on any programmes that I am aware of. Would you agree with that, Mr. Mundy?

Mr. Mundy: Well, Mr. Chairman, if I may add a word on this; It is true that for the particular programme that we have authority from the government to provide assistance to industry that the degree of funding is not a particularly limiting factor. However, I think that what may well be a limiting factor is the degree of incentive which is provided to Canadian industry bearing in mind their competitive position, *vis-à-vis* other industries of other governments who have a wide range of programmes which, in many instances, give a much higher degree of support than we do.

The Chairman: What would be the general proportion of the application you are rejecting now?

Mr. Mundy: Well, in the programmes that I am dealing with, I think it is quite rare when we in fact reject an application.

The Chairman: So that you do not receive many applications?

Mr. Mundy: No, I think it is true to say, Mr. Chairman, that the applications are not coming forward in the volume that we would like to see them come forward. You cannot necessarily reach the conclusion from this that it is sloth on the part of industry. I think the conclusion that could be reached is that, in terms of business judgment, they are not attractive enough for them to enter into the very high degree of risk into which they have to enter.

The Chairman: This is an assumption or is it a conclusion that you had arrived at from your experience and your discussions with industry?

Mr. Mundy: I would say it is a conclusion, not an assumption, Mr. Chairman.

Senator Bourget: Has he got enough contacts with the industry?

Mr. Mundy: Yes, sir. The whole of our department is structured so we have contacts with all Canadian Industry.

The Chairman: But, if it is generally agreed that industry does not do enough and that your programmes are not attractive enough, what remains to be done?

Mr. Mundy: I think what remains to be done is to try to devise programmes acceptable to the government which are also acceptable to the industry.

Mr. Warren: And to fund them as required.

Senator Bourget: Has industry asked anything from you? Have they made recommendations to improve or change the existing propetitive position, *vis-à-vis* other industries of is not represented in all the programmes you have there, there must be something lacking there.

Mr. Warren: The industry is very interested. We are reviewing programmes in the department to see where they can be improved on a basis acceptable to the government and more attractive to business.

The Chairman: You refer in your brief to a review of these programmes which has been made for the Treasury Board. At what stage is that study at present?

Mr. Warren: That study is under review in the Treasury Board at present.

The Chairman: It has been presented to the Treasury Board?

Mr. Warren: Yes.

The Chairman: Then you also referred to the desirability of integrating all the programmes designed to stimulated industrial research. Would you care to further comment on this? You would include, of course, the grants which are offered by the National Research Council and by the Defence Research Board.

Mr. Warren: In our review of programmes, these, as well as our own programmes, have been displayed and analysed. I don't think, unless I am mistaken, sir, that I referred to a total integration. I may have referred to an integrated approach.

The Chairman: But, what do you mean then by "an integrated approach"?

Mr. Warren: Well, as I mentioned in my comments to you this morning, we feel that the most sensible approach to the business of developing our industry in the areas where there will be marketable products, which in most cases will involve important inputs of new technology, is to look at the spectrum of the product cycle from the point of conception of the idea, the research, the development, through to the prototype, pre-production, production and marketing. It is the feeling of the department, and I think it is the feeling of those who worked with us in this review, that the display of government programmes should be such that the spectrum is adequately covered in a balanced way so that when something is begun and which, in its initial phases proves fruitful, there are other programmes of assistance that help industry to pick it up and bring it through to the production stage. That is the approach we are taking and we hope that the different programmes, many of which are administered in our own department and some of which are administered by the National Research Council and the D. R. B., will do that in the sense of covering the spectrum and permitting a logical sequence to move through the business system.

The Chairman: They are not doing that now?

Mr. Warren: There is a very close working relationship, sir, between the different programmes because of the interlocking nature of the committees, but we feel the programmes can be adjusted to do the job better.

The Chairman: You speak here of the necessity for greater co-ordination of these various programmes.

Mr. Warren: That is correct.

The Chairman: You would not encourage the complete integration of these programmes and making one government agency, like your department, responsible for all these programmes?

Mr. Warren: Well, if that were the government's decision, we would be very happy to do it, but I think that at the moment we are aiming for a better co-ordination of the services of programmes rather than saying the D.R.B. and the N.R.C. must yield up entirely their interests in this field.

The Chairman: Yes. Now, in terms of economic research, we have not touched on this very much this morning, but I understood from your brief that the kind of economic research which is done in the department is purely what I would describe as development work. It leans to advise exclusively and that sort of thing.

Mr. Warren: It does not exclude, by any means, new techniques of analysis.

The Chairman: Which are necessary.

Mr. Warren: Tailored to our needs in the department as set by the objectives of the department. So that there is a good deal of work done that way to good purpose. I don't think we have what you would call pure economic researchers trying to push back the frontiers of knowledge about economics. Perhaps Mr. Macklin, who is here with me, could comment.

V. J. Macklin, General Director, Office of Economics Branch: Mr. Chairman, the main crux of the economics work in the department is directed to the continuing review of the development of the Canadian economy and of the world economy as it affects the Canadian economy and particularly to the various aspects of that development relevant to the decisions which have to be made in the department. This work is done, for example,

to permit us to look at performance of the total economy or performance in commodity markets and in country markets; also to provide perspective and background and briefing in connection with particular decisions that have to be made and issues that arise, which, as you can appreciate, are very numerous; and also to look at the economic implications of alternate courses of action in various fields. This work then is primarily what I think you might call applied analysis. Now, of course, in doing this we, as resources permit, try to improve the techniques and methods of that analysis. But, I would say that this aspect of our work is supplementary to the applied analysis to which I referred.

The Chairman: One of the reasons I asked that was that the cover of your brief this morning reminded me of the cover of the "Hidden Report", so I was wondering if the "Hidden Report", was prepared in your department, but I know it was not.

Well, if we are to go on, I suppose that Senator Carter would leave very soon. I would be alone here and we might adjourn to have a nice chat. I would certainly have quite a number of other questions to ask. But, I

suppose that we will be able to pursue this discussion on another occasion.

Senator Carter: Are we meeting this afternoon?

The Chairman: I do not think so.

Senator Carter: I thought we were.

The Chairman: Well, this is not my understanding. We may have to revise this.

Would you remain available in case and we will communicate with you by telephone?

Mr. Warren: Of course.

The Chairman: In any event, we will check and if we do not come back I wish to thank you very much, at least provisionally.

Mr. Warren: I would like to thank you, sir, and through you, the committee, for a very stimulating and thought provoking session for us. There are some ideas here as to areas of work we will want to take under advisement.

The Chairman: Thank you very much.

The committee adjourned.

DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE

SUBMISSION
TO
THE SENATE OF CANADA
SPECIAL COMMITTEE ON SCIENCE POLICY

APRIL, 1969

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FOREWORD

1. This submission is presented on behalf of the newly created Department of Industry, Trade and Commerce. The information supplied in this brief is organised insofar as possible on the basis of the responsibilities and functions of the unified Department. It will be apparent, however, that much of the historical data relates to the period before the merger of the predecessor departments.

2. A few difficulties were encountered in providing some of the detailed information requested, partly because of the organizational changes that have taken place in the past few years, and partly because the scientific activities are not always isolated and recognizable within a department concerned with the whole field of industrial development and trade promotion.

3. At the request of the Deputy Minister of the Department of Industry, Trade and Commerce, the Office of Science and Technology undertook the compilation of this brief.

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- W. Canadian Federal Government Expenditures in Industry for Research & Development 1958-59 to 1967-68 compared with Gross National Product.

1. HISTORICAL BACKGROUND

1.1 The Department of Industry (DOI) came into being with the passage of an Act respecting the Department of Industry in July 1963, the general intent of which was that the new Department should promote the welfare of Canadian manufacturing industry.

1.2 The Department was initially organized in close coordination with the then existing Department of Defence Production (DDP). In fact, at both intermediate and senior levels a number of positions were common to both departments. During 1967 a decision was reached to separate the two departments and by November 1967 when the Department of Industry moved to its present quarters, separation was essentially complete.

1.3 During the latter half of 1968 and continuing into 1969, the functions of the Department of Industry were progressively integrated with the Department of Trade and Commerce. The new department of Industry, Trade and Commerce came formally into being on March 28th, 1969, when assent was given to the Government Organization Bill 1969.

1.4 The merger has consolidated the involvement of the operating branches in the fields of science and engineering since those branches of the Department of Trade and Commerce whose work encompassed these fields have now been amalgamated with the corresponding industry branches from the Department of Industry to form the operating branches of the new department. The office of the Industrial Research Adviser (now the Office of Science and Technology) continues to have the prime responsibility for science policy and for ensuring the scientific integrity of all departmental activities.

2. ROLE AND OBJECTIVES

2.1 The objective of the Department of Industry, Trade and Commerce is to "promote the establishment, growth and efficiency of manufacturing, processing and tourist industries in Canada, contribute to the sound development and productivity of Canadian industry generally and foster the expansion of Canadian trade".

2.2 A major factor in meeting this objective is the part played by science and technology in industrial growth and productivity. There are a multitude of areas and a variety of ways in which science and technology impinge upon this task. These vary from the establishment of completely new industries and industrial sectors such as the various synthetic materials industries (e.g., fibreglass reinforced polyester) and the solid state devices sector of the electronics industry, to major improvements in existing industries, as for example, the oxygen process in steel making, the developments in the field of powdered metals or the use of automatic process control in a wide range of process industries.

2.3 In addition to the direct effect of creating new industries, displacing old established industries and providing a steady stream of innovations for existing industry, science and technology has created a major challenge in the areas of staff training and skills over the whole spectrum of workers from the semi-skilled laborer to the most senior executive. Retraining, redirection and reorientation of whole groups of skilled workers is becoming a continuous process.

2.4 The importance of the impact of new technology - which has developed out of scientific research and engineering development - on almost every phase of every industry has been recognized by most countries as warranting particular attention at the Government level.

Accordingly, in its organization the Department of Industry was structured especially to take into account this most significant factor in the development and expansion of a sound Canadian manufacturing industry. Over the past four years, the Department of Industry has engaged in a wide range of study and analysis principally in the areas of engineering, technology, and economics. The prime purpose of these activities has been to achieve an understanding of the characteristics, problems, needs and potentials of the various industry sectors and as a result a number of

2.4 (Continued)

programs have been formulated and set in operation. Most of these programs have aimed at encouraging industry to increase its R & D activity and to undertake technical and management innovation; they have been responsive to industry's needs as understood by the Department. All projects supported have resulted from specific applications for assistance under the various programs.

3. ORGANIZATION

3.1 Department Organization

3.1.1 The Organization chart presented as Appendix A shows the current organization of the Department of Industry, Trade and Commerce.

3.2 Channels of Communications

3.2.1 The Department reports to Parliament through the Minister of Industry, Trade and Commerce. An annual report showing the operations of the Department is submitted to Parliament by the Minister on or before the 31st day of January each year.

3.2.2. Communication between the Department and other Federal Departments and agencies include a structure of interdepartmental committees. Representatives of the Department serve on certain advisory committees of other government departments and agencies. Where necessary and appropriate external members of these committees are drawn from industry and the universities as well as other Federal agencies. The work of the Department is assisted and liaison with industry is facilitated through numerous advisory committees.

3.2.3 Appendix B is a list of the Department's advisory committee and interdepartmental committees on which the Department is represented.

3.3 Units Responsible for Scientific Activities

3.3.1 The Department does not undertake intramural research and development. It funds extramural research and development through its incentive and assistance programs. Internally it carries out technical and economic studies, which provide an essential base for policy recommendations and for the industrial assistance programs.

3.3.2 The responsibility for scientific activities is spread throughout the Department, and almost all units have some responsibility in this area. The units most actively involved are the Office of Science and Technology, Office of Economics and the Operating Branches. The units involved in scientific activities are shown on the organizational chart of Appendix A.

Special Committee

3.3.3 The basis of the original DOI organization was ten operating branches (now nine), each representing a particular industrial sector as shown in Appendix A. Each branch is concerned with a number of fields of technology employed by the industry concerned, and includes personnel with a variety of backgrounds such as economics, marketing and engineering.

3.3.4 In addition to the appreciable strength in engineering in the branches, three advisory groups were established reporting directly to the Deputy Minister - the Office of the Industrial Research Adviser, the Office of the Economic Adviser and the Industrial Policy Adviser. The prime role involving science policy was assigned to the Office of the Industrial Research Adviser. This office was given the responsibility for ensuring the scientific and engineering integrity of all departmental activities.

3.3.5 In the new combined department two of these offices, Industrial Policy and the Industrial Research Adviser (now the Office of Science and Technology) remained essentially unchanged. The Office of the Economic Adviser is now incorporated in the Office of Economics.

3.3.6 The structure and the responsibilities of the Office of Science and Technology (OST) are described in detail in Appendix C, however, it may be useful at this point to summarize the role of this office.

3.3.7 The office provides a cadre of qualified specialists in the various scientific or engineering disciplines to formulate policy recommendations to promote technological progress in industry, to advise on specific technical questions which arise in the various Departmental programs and activities, and generally to provide a capability for sound direction and decision-making on scientific and technical issues.

3.3.8 In addition to advising the Minister and Deputy Minister on specific questions of a scientific nature affecting Departmental or Government policy, this office also formulates plans, develops programs and generally has cognizance over the scientific/technological activities of the Department. Moreover, OST endeavours to communicate within Government industry needs in the area of science and technology and inject techno-economic and related industrial considerations into the formulation of national science policy and the research programs of the various Federal Government Departments which affect industry.

3.3.9 Since one of the major functions of this office is the development of programs in support of industrial R & D, it was considered that the office should administer these programs, at least in their early stages. Accordingly the Office of Science and Technology has administered several technological programs such as the Program for Advancement of Industrial Technology (PAIT) and the Industrial Research and Development Incentives Act. These technological programs are described elsewhere.

3.3.10 The work of the Office of Economics consists largely of interpretative reporting, briefing and advisory activities necessary for the day-to-day work of the Department and Government, including the development and implementation of policies and programs of an operational nature. Such activities involve for the most part the assimilation and application of existing information or theory to particular issues or tasks. They do not customarily involve the development of new theory or knowledge and, accordingly, are not considered to come within the scope of research activities as defined. (See Appendix T).

3.3.11 To improve the usefulness of this informational and advisory function it is necessary from time to time to collect new information and evolve new techniques or methodology. Such activities are in support of the main operational functions of the Office of Economics.

3.3.12 It will, therefore, be apparent that the economics work of the Department consists primarily of informational and advisory programs involving some supporting research activities which are carried on as integral parts of the operational programs by operational personnel.

3.3.13 Finally, the International Defence Programs Branch, operating within the Branch structure of the Department, administers a major industrial R & D support program - the Defence Industry Productivity Program (DIP).

3.4 International Agreements

3.4.1 To assist in meeting the Department objectives, the Department of Industry, Trade and Commerce, in conjunction with other departments (mainly Department of National Defence, Department of Defence Production and Department of External Affairs) undertakes measures to encourage the development and production in Canada of defence equipment to meet the needs of allied countries. This is done in order to offset in part the effect on our balance of international payments resulting from substantial purchases of defence equipment abroad for our Armed Forces and to assist in maintaining an industrial defence base in Canada at an adequate and competitive level of technological sophistication. These measures include the negotiation of cooperative defence research, development and production (RDP) arrangements between Canada and other friendly nations, and the promotion of export sales of Canadian defence products.

3.4.2 The International Defence Programs Branch is the organizational unit which has the responsibility for overall defence market development and promotion, and the establishment of RDP arrangements with other countries.

3.4.3 A major part of the activity of the International Defence Programs Branch fosters "scientific activity" as defined in Appendix B of the Guideline, Senate Special Committee on Science Policy. In carrying out its activities the International Defence Programs Branch seeks out, identifies and gathers intelligence on opportunities with

which to promote RDP programs and assists in negotiating Government Agreements which provide a basis for establishing specific RDP projects. Implementation of programs and projects is carried out in conjunction with Canadian defence industry.

3.4.4 The Department has formal and informal agreements with a number of foreign countries covering various aspects of cooperative defence research, development, and production activity. A list of the more important agreements is given in Appendix D.

3.4.5 These agreements have provided a broad framework within which development and production has eventually taken place in Canada. The agreements have, therefore contributed to the advancement of Canadian technological capability and capacity.

3.5 Overseas Offices

3.5.1 The Department maintains, through its International Trade Commissioner Service, offices in most countries of the world. These offices, however, are only incidentally concerned with scientific activity.

3.5.2 Members of the International Defence Programs Branch are stationed at offices in the following countries.

Belgium, Brussels

France, Paris

Germany, Bonn

Italy, Rome

United Kingdom, London

United States, Boston, Dayton, Detroit,

Los Angeles, Philadelphia

4. ORGANIZATIONAL FUNCTIONS4.1 Statutory Responsibilities and Functions

4.1.1 The activity of the Department of Trade and Commerce in the area of enquiry was minimal.

4.1.2 The statutory functions and powers of the Department of Industry were those contained in the Department of Industry Act which is reproduced as Appendix E. Subsection (III) of Section 7 of the said Act reads as follows: -

"To promote the development and use of
modern industrial technology in Canada and
improve the effectiveness of the participation
by the Government in industrial research."

4.1.3 The statutory functions and powers of the new Department of Industry, Trade and Commerce are set out in Part III of the Government Organization Act, 1969, which is reproduced as Appendix V.

4.1.4 The Department has the statutory responsibility for the administration of the Industrial Research and Development Incentives Act which is reproduced as Appendix F. This Act provides grants, payable in retrospect, which are based on the capital expenditures and operating expenses undertaken for research or development activity. The grant amounts to 25% of approved capital expenditures plus 25% of the amount by which eligible expenditures made in any year exceed the average of such expenditures for the preceding five years.

4.2 Functions and Responsibilities in Relation to Other Federal Agencies

4.2.1 It is the responsibility of the Department to ensure that the needs and problems of Canadian industry in the area of science and technology are well known to the National Research Council, Defence Research Board and the Departments of Transport, Communications, Energy, Mines and Resources, and Agriculture. Conversely, the Department is heavily dependent upon these agencies for technical advice and guidance in its day to day evaluation of industrial proposal and its development of policy, long term plans and programs.

4.2.2 This Department receives a continuous flow of advice and assistance from the large research laboratories of NRC, DRB, and EMR, and similar but less frequent help from many other government agencies. A number of interdepartmental committees provide excellent liaison.

4.3 Functions and Responsibilities
in Relation to Industry

4.3.1 It is a responsibility of the Department to analyse and make known within Government the viewpoint and interests of the manufacturing and processing industry. This includes interpreting industry needs relative to R & D and technological innovation, anticipating the effect of new technology and helping to ensure a Canadian environment which encourages industry to develop a sound scientific and technological base. The Department is frequently invited to take part in interdepartmental discussions in order that it may make known the interests of Canadian industry. A particular case in point is the Canadian Communications Satellite program. The then Department of Industry was invited by the Satellite Communications Project Office to attend Project Office planning meetings and officers of the Department are currently maintaining close liaison with the Department of Communications personnel to ensure optimum benefit to Canadian industry.

4.4 Functions and Responsibilities in
Relation to Educational Institutions

4.4.1 It is the view of this Department that Canada has much to gain from a closer liaison than that which now exists between industry and educational institutions - particularly universities and technical institutes. Accordingly, the Department sponsors specific programs and continuing activities to this end where appropriate. The Industrial Research Institute Program, which is described in detail in Appendix P, is an effective functioning example.

4.5 Functions and Responsibilities in Relation to International
Scientific Activities

4.5.1 The Department is represented at meetings of international organizations such as OECD and has supplied specialists to assist the deliberations of OECD committees.

4.5.2 Personnel of the Office of Science and Technology are charged with the responsibility of monitoring scientific activities related to industrial development outside Canada by visits to scientific agencies both public and private in other countries and by attendance at scientific meetings and conferences.

4.5.3 The operating branches have organized a number of industrial missions to the U.S. and overseas to study the technology, equipment, productivity, and management of a variety of industries. This has proved to be an effective means whereby industry can obtain a first-hand knowledge of important advances in industrial technology. A partial list of these missions is given in Appendix G.

4.6 Review of Operational Effectiveness,
Duties and Goals

4.6.1 As previously discussed, following initial organization, the Department of Industry has been reorganized twice - at the time of separation from the Department of Defence Production, and at integration with Trade and Commerce. Operational effectiveness, responsibilities and goals have been reviewed upon each occasion. The mechanisms for regular review and revision of the new Department of Industry, Trade and Commerce are presently being developed.

4.7 Outside Studies of Operating Procedures

4.7.1 There have been none.

4.8 Relationship Between Responsibilities and Powers,
and Activities

4.8.1 The relationship between the responsibilities of the Department and its activities and programs is discussed in the previous sections. The Department has authority to execute plans and programs such as those described and is free to seek authority (or propose legislation) for new programs as it deems necessary.

4.9 Major Hindrances

4.9.1 Analytical work on industry problems including those concerned with the application of science and technology would be improved if DBS statistics were available on a more detailed basis and in some cases more promptly.

4.9.2 The effectiveness of the government's activities in the areas of science and technology as they relate to industrial development would be improved through greater coordination of the various programs involved.

4.10 Changes in Organization Functions

4.10.1 The Government Organization Act 1969 which received assent on March 28th, 1969 established the new Department of Industry, Trade and Commerce.

4.10.2 The duties, powers and functions of the new Minister of Industry, Trade and Commerce are set forth in Sections 15, and 16, as follows:

Section 15

"The duties, powers and functions of the Minister of Industry, Trade and Commerce extend to and include all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, branch or agency of the Government of Canada, relating to:

(a) manufacturing and processing industries in

Canada:

(b) tourism; and

(c) trade and commerce generally."

Section 16

(a) promote the establishment, growth and efficiency of manufacturing, processing and tourist industries in Canada, contribute to the sound development and productivity of Canadian industry generally and foster the expansion of Canadian trade;

(b) develop and carry out such programs and projects as may be appropriate to (i) assist manufacturing and processing industries to adapt to changes in technology and to changing conditions in domestic and export markets, (ii) assist manufacturing and processing industries to develop their unrealized potential to rationalize and restructure their productive facilities and corporate

organizations and to cope with exceptional problems of adjustment, and

(iii) promote and assist product and process development and increased productivity, the greater use of research, the application of advanced technology and modern management techniques, the modernization of equipment, the utilization of improved industrial design and the development and application of sound industrial standards in Canada and in world trade.

(c) improve the access of Canadian produce, products and services into external markets through trade negotiations and the promotion of trade relations with other countries and contribute to the improvement of world trading conditions:

(d) promote the optimum development of Canadian export sales of all produce, products and services:

(e) provide support services for industrial and trade development, including information, import analysis and traffic services:

(f) analyze the implications for Canadian industry, trade and commerce and for tourism of government policies related thereto in order to contribute to the formulation and review of those policies:

(g) compile and keep up to date detailed information in respect of manufacturing and processing industries in Canada and of trends and developments in Canada and abroad relating to Canadian industrial development and trade; and

(h) promote the optimum development of income from tourism and compile and keep up to date detailed information in respect of the tourist industry and of trends and developments in Canada and abroad relating to tourism.

5. PERSONNEL POLICIES5.1 Hiring Policies

5.1.1 The Department does not itself, carry out research and development. Accordingly, it has no need for policies and criteria to identify those who will be effective researchers.

5.1.2 To fulfil its responsibilities effectively the Department does, however, require personnel with a knowledge of the Canadian Secondary Manufacturing Industry, and in some cases with a demonstrated capability in the research and development area. It has been the policy, therefore, in manning the industry line branches, to hire a majority of experienced professional personnel; only a relatively small number are hired from the university graduating classes. In the operational branches the requirement is for people with a general rather than a specialized technical background. In the Office of Science and Technology it is the policy to recruit those with extensive experience in research, development, or sophisticated engineering design.

5.1.3 All personnel are recruited through the Public Service Commission with which the Department works in close collaboration.

5.1.4 On occasion some difficulty has been experienced in obtaining qualified and experienced people as the Department is in direct competition with industry.

5.2 Further Education of Staff

5.2.1 Staff are encouraged to maintain and develop their professional competence by continuing education. Encouragement is given to the acquisition of additional academic training by defrayment of one-half of the fees incurred for relevant evening courses. Individuals are also sent, as appropriate, on short courses which will have direct benefit, and full salary and expenses are paid.

5.2.2 Staff are selected to take courses offered by the Department or the Public Services Commission in such fields as administration, management and languages.

6. DISTRIBUTION OF ACTIVITIES6.1 Regional Pattern of Expenditures

6.1.1 The regional pattern of the Department's expenditures for scientific activities by provinces is shown in Appendix H.

6.1.2 The expenditures shown include all the major extramural disbursements of the Department according to the location of the organization receiving the grant. It is realized, however, that the receiving organization may spend the grant in whole, or, in part in a province other than that in which it was received.

6.1.3 Department expenditures have been made in all the provinces except Prince Edward Island. The distribution of expenditures is of course strongly influenced by the existing geographical distribution of industry.

6.2 Regional Development

6.2.1 The general and specific assistance programs administered by the Department are available to all Canadian companies on an equal basis irrespective of geographical location. It might be expected, however, that the programs would contribute in some measure to regional development in that the smaller industries in the less industrially developed provinces may find it more difficult to obtain financing from private sources.

6.2.2 An example of the way in which the incentive programs can help in regional development is the assistance given towards creation of a crab fishing industry on the east coast through financial assistance under the PAIT program.

6.2.3 The Industrial Research Institutes, which are discussed in a later section of this brief are likely to prove of particular value in the western and maritime provinces. In these provinces access to expert advice is often more difficult to obtain than in the highly industrialized central provinces.

6.2.4 The Area Development Agency which until the recent reorganization was part of the Department of Industry was specifically charged with the responsibility for regional development. Section 10 of the Department of Industry Act read as follows: -

"The undertaking of research and the making of investigations respecting the means of increasing employment and income in designated areas; and the preparing and carrying out of such programs and projects to improve the economic development of designated areas as may be appropriate to the purpose of this Part and that cannot be suitably undertaken by other departments, branches or agencies of the Government of Canada,"

7. PERSONNEL ASSOCIATED WITH SCIENTIFIC ACTIVITIES

7.1 The present establishment and strength of the Department is given in Appendix I.

7.2 The statistical data requested for the professional staff of the units associated with scientific activities is provided in Appendix I.

7.3 The number of staff in each degree category on educational leave is:

Bachelor	-	1
Master	-	1

7.4 The number of university students given summer employment is given in Appendix I. It is not possible to determine with any degree of precision the proportion of this number who were employed in the field of scientific activity.

8. EXPENDITURES ASSOCIATED WITH SCIENTIFIC ACTIVITIES8.1 Total Funds Expended

8.1.1 The external expenditures by the Department for scientific activities are given in Appendix J. It was not entirely possible to show the expenditures according to the categories given in the "Guide for Submission of Briefs and Participation in Hearings." Wherever possible, however, this has been done.

8.2 Operating and Capital Funds

8.2.1 The intramural expenditures on scientific activity cannot be derived from the existing records. The reason is that until now the resources were allocated and expenditures accounted for by the traditional governmental method based on objects of expenditure and organizational units. Hence there are no records on the expenditures associated with functions, scientific disciplines, etc., as defined in the guidelines. This situation will be ameliorated by the change to the Planning, Programming and Budgeting system.

8.3 Expenditures for University Education of Staff

8.3.1 Funds expended to further professional university education of staff were:

1967 - 68	\$2,060
1968 - 69	\$5,214

9. RESEARCH POLICIES9.1 Intramural Activities

9.1.1 The Department does not undertake intramural research but does carry out studies and analyses related to research, engineering development and technological innovation. As indicated in Section 2, these activities are aimed at an understanding of the problems, needs and potentials of all industry sectors. The resulting projects and programs have been directed to overall industrial growth and have been responsive to the initiative of those industries which have taken advantage of them.

9.1.2 The guiding principle in setting priorities and selecting from among competing industrial requests for assistance has been to aim at "maximum benefit to Canada".

9.1.3 For the type of activity outlined above, Critical Path Network (CPN) and Program Evaluation and Review Technique (PERT) are not normally necessary. These techniques are used, however, wherever it is appropriate to do so.

9.1.4 Considerable use has been made of consultants in support of intramural studies and programs. Examples of the use of consultants are cited in Appendix K.

9.1.5 It is not the policy of the Department to provide general support for research programs in the university. However, use is made of the universities in support of Department intramural studies, or, to undertake specific research projects where this is considered necessary in the national interest. Examples of such university support are given in Appendix L.

9.1.6 All programs and projects are under continuous review and evaluation. Projects are terminated or given lower priority and allocation of resources wherever it becomes apparent that greater benefit would be obtained from starting a new program or project.

9.1.7 Intramural and contracted extramural research results are transferred to those having potential need of them by formal and informal reports supplemented by personal contact.

9.2 Extramural Activities

9.2.1 The Department has proposed and had accepted for funding five major programs: -

Program for Advancement of Industrial Technology (PAIT)

Industrial Research and Development Incentives Act (IRDIA)

Defence Industry Productivity Program (DIP)

Industrial Research Institutes Program (IRI)

Building Equipment, Accessories and Materials Program (BEAM)

9.2.2 Full details of the objectives, methods of funding, administration, etc., of the above programs are given in Appendices M to Q.

9.2.3 The objectives, effectiveness, and administration of the various research and development incentive programs are currently being reviewed at the request of Treasury Board by an interdepartmental task force under the chairmanship of the Senior Assistant Deputy Minister of the Department.

9.2.4 Projects authorized, or supported, under any of the incentive programs, PAIT, IRDIA or DIP, are carried out by the industry or organization which initiated the proposal or claim. Since the federal government provides only part of the funds and more particularly because the objective of these programs is to strengthen the scientific and technological base of the applicant, the results including patents and proprietary information, remain the property of the organization receiving support. Transfer of these results to a third party is, however, subject to certain limitations specifically stated in the contract between the Government of Canada and the entrepreneur involved. As an example, under PAIT and DIP, technical information, design data or details or processes, may not be transferred for the purpose of production outside of Canada without permission of the Minister.

10. RESEARCH OUTPUT10.1 Patents

10.1.1 Any patents arising from the research and development activities supported by the Department's general and specific incentive programs - PAIT, IRDIA, DIP - are the property of the company or organization doing the work. The number of patents obtained is not known.

10.1.2 As the Department does not have the patent rights arising from its support of industrial research and development the licensing of patents is not a normal activity of the Department.

10.2 Books and Journal Articles

10.2.1 Research findings originating in projects supported by the Department are proprietary to the firm and therefore publication would only be made by the company concerned at its discretion.

10.2.2 Department personnel have, however, published in the technical and professional journals, articles dealing with the scientific activities of the Department. A complete list of these articles is not available, but some typical examples are given in Appendix R.

10.3 Department Reports

10.3.1 The Department prepares reports on its internal scientific activities, and on information obtained from external sources. These reports are given appropriate government, industrial, and public circulation. A partial list of department reports is given in Appendix R.

10.4 Conferences

10.4.1 The Department sponsors and arranges conferences and seminars where this is the best method of transferring essential information to industry. It is a valuable way of stimulating industry to incorporate in their everyday practices the latest technological advances. Appendix S gives details of conferences sponsored by the Department.

10.4.2 Members of the Department frequently present papers at international, national, and professional meetings and conferences.

10.5 Transfer of Foreign Scientific and Technological Data

10.5.1 Foreign scientific and technological data obtained by the Department is transferred to industry and other extramural groups by meetings, reports and by personal contact.

10.6 Former Staff

10.6.1 Staff turnover has been minimal since the establishment of the Office of Science and Technology in 1964. Turnover in the Economics Branch has also been small; a few economists have moved into other government departments and agencies, and a few to industry and banking.

10.7 Office of Science and Technology

10.7.1 Since no intramural research is undertaken in the physical sciences, no research teams, in the usual sense, have been developed. A group of scientists and engineers covering a wide range of science and technology has been established in the Office of Science and Technology. These men have been carefully selected to provide highly qualified specialists in each of the fields listed below.

Industrial Chemicals and Pharmaceuticals

Polymer Chemistry and Foods

Textile Technology

Metal Technology

Mechanical Engineering and Production Processes

Transportation Technology

Aerospace Technology

Power Systems

Communication Systems

Computer and Control Systems

Electrical and Electronics Technology

10.7.2 They had, before joining the Department, reached a position of Director of Research in a large industry or were undertaking advanced sophisticated engineering design. This group represents an effective team which has initiated directly or provided the nucleus for study groups which have been responsible for major scientific and technical studies not only to meet departmental requirements, but also for inter-departmental purposes such as:

Special Committee

1. Scientific and Technical Information
2. Domestic Satellite Communications
3. Transportation
4. OECD Technology Gap Studies

10.8 Office of Economics

10.8.1 A second strong professional team has been developed in the Office of Economics. This team includes seven economists with doctorate degrees.

10.8.2 The Office of Economics consists of four main Branches, namely; General Analysis, Investment Analysis, Market Analysis and Productivity. Each of these Branches conducts scientific support activities to some extent, but in each case such activities are subordinate to the primary informational and advisory function. The work of this team is described in Appendix T.

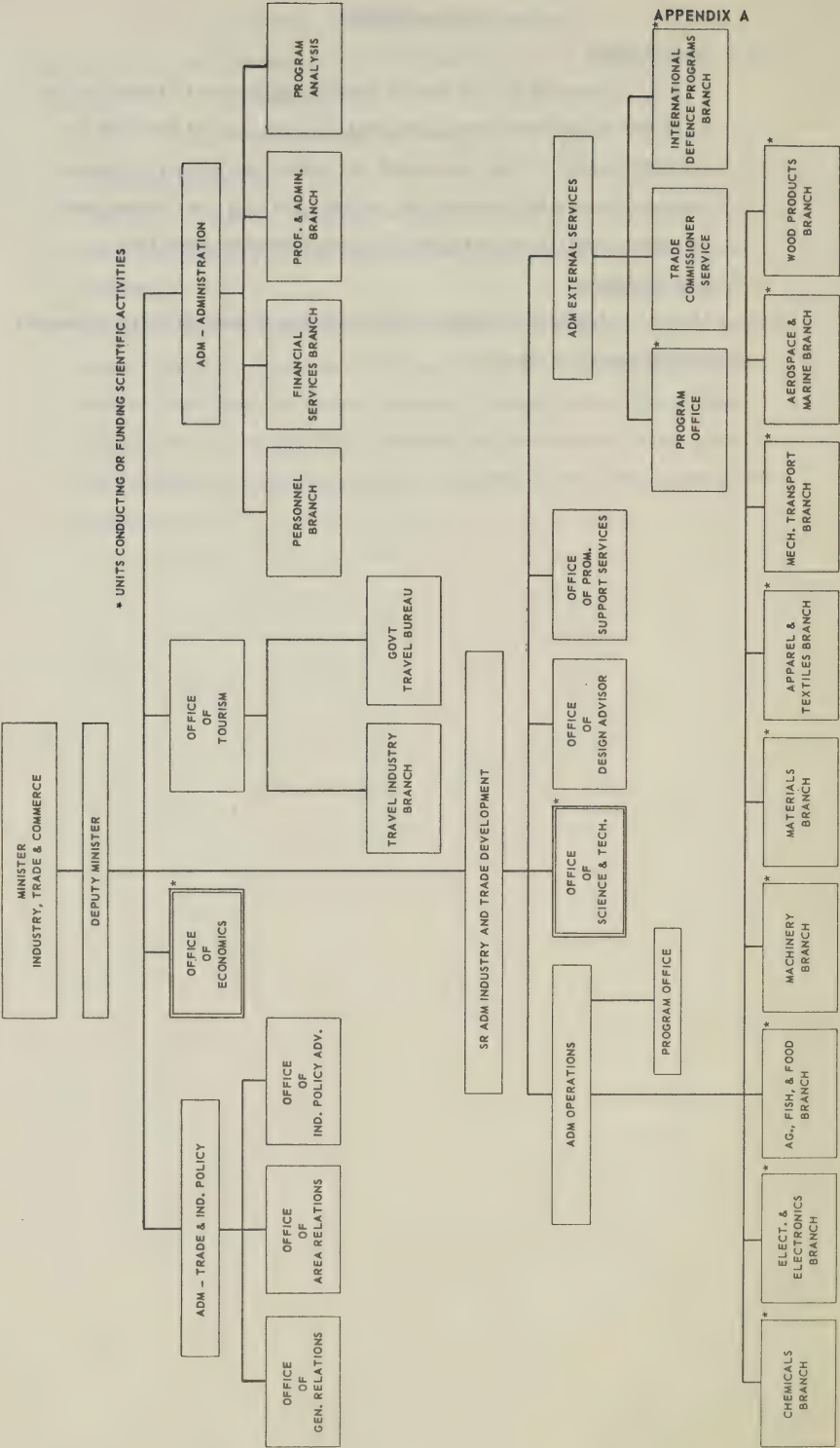
11. PROJECTS11.1 Project Lists

11.1.1 Appendix T is a partial list of the projects carried out by or funded by the Department since 1962. In the case of PAIT and DIP projects because of the requirement for industrial secrecy it is not possible to give the title of the project, but only the company name. No project details are available for work performed under IRDIA.

11.2 Case Histories

11.2.1 Appendix U presents case histories of some selected intramural and extramural projects.

DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE



Appendix B

Inter-departmental and Advisory Committees
Having DITC Representation

Advisory Committee, Program for Advancement of Industrial Technology

Inter-departmental Committee for Defence Development

Weapons Advisory Group

Canadian "Mallard" Advisory Group

Electronics Advisory Group

Inter-departmental Committee, Defence Industry Modernization for Defence Export Program

Defence Research Board, Advisory Committee on Defence Industrial Research

Inter-departmental Committee on Wood Harvesting

Inter-departmental Committee on Low Cost Textile Imports

Inter-departmental Advisory Committee on Furniture

Inter-departmental Advisory Committee on Lumber

Inter-departmental Advisory Committee on Plywood and Panel Products

Inter-departmental Sub-committee on Hearing Aid Industry

National Research Council, Associate Committee on Propulsion

National Research Council, Associate Committee on Avionics

National Research Council, Associate Committee on Aerodynamics

National Research Council, Associate Committee on Aeronautical Structure and Materials

National Research Council, Associate Committee on Agricultural and Forestry Aviation

National Research Council, Associate Committee on Automatic Control

National Research Council, Associate Committee on Geodesy and Geophysics

National Aeronautical Establishment, Technical Advisory Panel

National Research Council, Advisory Committee, Industrial Research Assistance Program

Inter-departmental Advisory Committees, Canadian Government Specifications Board, on:

paper sizes	water proofing
furniture	plastics
paints	packaging materials
soaps and detergents	silicon water repellants
chemicals	adhesives
sealants	drug manufacture
waxes and polishes	painting standards
corrosion prevention	concrete curing compounds

Machinery Equipment Advisory Board

National Advisory Committee on Mining and Metallurgical Research

Committee on the Approval of Building Materials

Advisory Committee on Industrialized Building Techniques and Systems

Advisory Committee on Construction Information Centres

Advisory Committee on Modular Coordination

Uranium Policy Committee

Army Reconnaissance Scout Vehicles Committee

Functions and Responsibilities of the
Office of Science and Technology

1.0 Science/Technology Policy and Planning

The Office of Science and Technology provides a cadre of qualified specialists in the various scientific or engineering disciplines to formulate policy, to promote technological progress in industry, to advise on specific technical questions which arise in the various Departmental programs, and activities, and generally to provide a capability for sound direction and decision-making on scientific and technical issues.

In addition to advising the Minister and Deputy Minister on specific questions of a scientific nature affecting Departmental or Government policy, this Office also formulates plans, develops programs and generally has cognizance over the scientific/technological activities of the Department.

Moreover, the Office of Science and Technology (OST) acts as the spokesman within Government for industry research needs and injects technoeconomic considerations into the formulation of national science policy and the research programs of the various Federal Government Departments which affect industry.

2.0 Scientific Services

The provision of a scientific "intelligence" to guide policy formulation and program activities is provided by a nucleus of specialists in each of the major scientific or engineering discipline of concern to Canadian manufacturing industry. The aim of OST is to provide leadership in all scientific matters with which the Department is concerned and endeavour to ensure the scientific integrity of its programs.

2.1 Scientific Advice and Technical Appraisal

Scientific advice and guidance is required in many aspects of the Department's activities, quite apart from the obvious needs of the various R & D programs. Technical appraisals are required for all PAIT projects and a substantial number of IRDIA claims. In addition, evaluations are carried out for all projects submitted under the Defence Export Development Program, the DRB Defence Industrial Research Program, and the NRC Industrial Research Assistance Program in each of which the Department participates as a member of the respective advisory committees.

2.2 Scientific Liaison

The scientific consultants act as the link between the Department and the scientific community both within and outside government especially with a view to enlisting the support and active participation of government laboratories, universities and technical societies in support of Departmental programs. In particular, OST maintains close working relationships with the Science Council, Science Secretariat, Privy Council Committee on Scientific and Industrial Research, National Research Council, as well as various international agencies such as the Organization for Economic Cooperation and Development.

2.3 Technological Forecasting

The forecasting of technological trends likely to result from current scientific research provides the essential basis for the formulation of industrial policy and long-term planning. This involves continuous review of latest developments in fundamental science, and the assessment of their impact on the various industrial sectors leading to recommendations for new policies or programs designed to exploit the new technological opportunities.

2.4 Techno-Economic Studies

In identifying worthwhile directions for the concentration of industrial research effort and in formulating plans therefor, there is a continuing requirement to undertake systems analyses, studies in depth of technical feasibility, and assessments of the commercial feasibility of different technical solutions to industrial problems or opportunities. Such studies involve the formation of inter-disciplinary study groups under competent leadership to provide factual data as a basis for program direction and as a guide to the selection of R & D projects for Departmental support.

Past studies have included the industrial impact of the AECL Intense Neutron Generator Project, Canadian industrial capability for the development of a Domestic Communication Satellite, Systems Definition and Planning Studies for a Domestic Communications System, Studies of the State of Technology and Innovation in six Canadian industries (contribution to OECD "Technology Gap" studies).

2.5 Scientific and Technical Information

In terms of industrial progress, the effective utilization of existing technical information is probably just as important as the

2.5 (continued)

generation of new scientific knowledge. An important task therefore is the establishment of an effective system for storing, classifying, retrieving and disseminating scientific and technical information in a form which can be readily assimilated and applied by industry. To this end, OST fostered the initiation of a national study on this subject under the sponsorship of the Science Secretariat and made a major contribution in terms of manpower and financing. When the study is complete, it is expected that OST will have a major role to play in the implementation of its recommendation as regards the provision of scientific and technical information to Canadian industry.

An Information Systems Analysis Centre (ISAC) has been planned and extensive data on information systems and techniques has been acquired.

3.0 Technological Programs

In furtherance of the Department's technological mission, three major programs of direct financial assistance for industrial R & D have been established together with three programs for the provision of technical services to industry. OST bore full responsibility for policy formulation, program planning and implementation of each of these programs. For the IRDIA and PAIT programs which involve many individual projects and firms, casework is undertaken by the appropriate industry sector branches with control and coordination being exercised by program offices. In all other programs which deal with industry collectively and which do not lend themselves to a sectoral approach, program administration is centered in OST.

3.1 Industrial Research Institutes

The purpose of the Industrial Research Institute program is to provide financial assistance to Canadian universities to help them establish and maintain research institutes to undertake contract research on behalf of industry. Assistance under the program takes the form of a grant payable in annual installments to cover costs of establishing and administering the Institute. To March 31, 1968, grants amounting in total to \$476,157.00 had been authorized under the Program to assist the establishment and maintenance of Industrial Research Institutes at four Canadian universities.

The program is administered by OST which is responsible for negotiating terms and conditions and administering agreements under which the grants are made. Applications are assessed against established criteria, and if satisfactory, are recommended to Treasury Board for approval.

3.2 Standards Council of Canada

Because of the importance of standards to the quality of industrial production and more especially to participation in international trade, the Department of Industry, Trade and Commerce took the initiative in promoting the formation of a national standards body to deal with all aspects of this matter. As a result, Cabinet authorization was given to proceed with the establishment of the "Standards Council of Canada" which would be responsible for general policy and coordination of standards activities on the national level, Canadian participation in international standards activities, and would provide a channel for government financial assistance to standards setting bodies.

A Secretariat has been set up in OST to arrange for the establishment of the Standards Council and the preparation of the necessary legislation. Eventually, although the Council will operate semi-autonomously, it is expected that the Department will act as the focal point for contact with the Federal Government and the channel through which financial support will be provided.

3.3 Technical Seminars and Publications

This program was established in recognition of the growing need for industry to be kept informed of new discoveries and developments in science and technology which has been taking place at an ever increasing rate in recent years. Under the program, the Department underwrites the cost of technical seminars and publications serving the needs of industry by reimbursing financial losses up to an agreed amount. To date a number of seminars have been sponsored under the program on such subjects as automatic process control, ultrasonics, technological forecasting, and polymer science.

The program is administered by OST which is responsible for assessing and approving applications for assistance under the program, and for negotiating the terms and conditions for support.

3.4 Analysis of Industrial R & D Performance

The analysis and interpretation of statistics on the R & D performance of Canadian industry represents an important input to the formulation of policies and the evaluation of the effectiveness of Departmental programs in this regard. A comprehensive survey of Canadian Industrial Research and Development for 1965 was presented to the Science Council, and will be

3.4 (continued)

re-issued biennially as new DBS statistics become available. This activity also involves comparison of Canadian industry performance against that of other industrialized nations and elucidation of the economic impact of research and development on industrial success and export achievement.

Appendix COffice of Science and TechnologyStatement of Duties and Responsibilities

1. To stimulate technical innovation in Canadian industry by promoting the development and use of modern technology and generally upgrading its technological capabilities and competence.
2. To improve the effectiveness of Canadian Government participation in, and support for, industrial research and development.
3. To advise on all scientific and technical matters relevant to Departmental responsibilities and to formulate and recommend appropriate policies, plans and programs therefor.
4. To advise with respect to national science policy and other aspects of government policy affecting the technological performance of Canadian industry (e.g. industrial standards, patent policy, procurement practice, etc.).
5. To identify the needs of Canadian industry for research and development and for related scientific and technical services (e.g. scientific and technical information, industrial standards, testing, and consulting) and to develop policy, plans and programs to meet such needs.
6. To be responsible for the policy aspects and scientific integrity of all technological programs and activities within the Department.
7. To evaluate and make recommendations on requests from industry, universities, trade associations, scientific and technical societies for assistance to promote industrial research and development or to provide related scientific and technical services for Canadian industry.
8. To provide advice and assistance to Branches of the Department and to other government departments and agencies on matters affecting or pertaining to industrial research and development and on other scientific and technical activities in Canadian industry generally.
9. To keep informed of scientific advances and of current activities in the various fields of industrial technology, and to assess their significance and relevance for Canadian industry by conducting technological forecasting and techno-economic studies.
10. To maintain effective working relationships and coordination with the scientific activities of other government departments and agencies, universities, and industry relating to Departmental interests (particularly the Science Council, Science Secretariat, National Research Council, Advisory Panel on Science Policy, etc.).

11. To represent the Department with respect to scientific and technical matters at national and international meetings and conferences of government, trade, industry, university, scientific, and technical organizations.
12. To evaluate the research and development performance of Canadian industry and to assess the effectiveness of Departmental incentive and assistance programs in this regard.

Appendix DInternational Agreements1. Canada - U.S.

- 1.1 Canada/U.S. Defence Production Sharing Agreements - 1959 and 1963.
- 1.2 Memorandum of Understanding in the field of Cooperative Development - November 1963 (Complementing the Can/U.S. Production Sharing Program by establishing a cooperative program in defence research and development).
- 1.3 Canada - U.S. Agreement for Qualification of Products (1968) (Defines conditions and procedures to be used for reciprocal listing of products of Canadian and U.S. manufacturers on Qualified Products Lists maintained by the U.S. Department of Defense and Canadian Department of National Defence.)

2. Canada - West Germany

- 2.1 Memorandum of Understanding regarding research, development and production (RDP) programs between the Department of Defence Production and the German Ministry of Defence (1965) (Provides for cooperation and collaboration in the field of defence development and production so that duplication of effort for common defence requirements can be avoided).
- 2.2 Agreement between Canada and the German Ministry of Scientific Research for the launching of rockets carrying German experiments and the establishment of a real time telemetry station at the Churchill Rocket Range. (The agreement is expected to be signed in the near future). Involves, in addition to the Department of External Affairs, National Research Council, Department of National Revenue (Customs & Excise) and the Department of Finance.

3. Canada - France

- 3.1 Intergovernment agreement (Nov. 1967) concerning Research Development and Production of defence equipment (Similar to 1965 agreement with West Germany).

Special Committee

4. Canada - U.K.

- 4.1 Informal agreement on defence RDP cooperation (1963).
Resulted in establishment of Anglo-Canadian Committee
for Cooperation in Defence RDP.

5. Canada - Norway

- 5.1 Agreement regarding joint production in Norway of M-72
light anti-tank weapon, using Canadian launcher and
Norwegian bomb.

6. Multi-Lateral Agreements

- 6.1 Memorandum of Understanding on development and evaluation
of a reconnaissance drone between Canada, West Germany and
United Kingdom (1965). (Provides for joint participation
in development).
- 6.2 Memorandum of Understanding on production of a reconnaissance
drone among Canada, West Germany and United Kingdom (1967).
(Provides for Cooperative Production).
- 6.3 Agreement on Joint Development and Production of a multi-role
combat aircraft (MRCA) - International Defence Programs
Branch personnel were largely instrumental in getting the
responsible authorities of Canada, West Germany, Italy,
Belgium, the Netherlands, and United Kingdom together to
work out the first phase of this joint program. Because
of financial problems and its incompleted defence review,
Canada has given notice of its inability to participate in
the program, at least at this time.
- 6.4 NATO - Departmental interest centres around the activities
of the conference of National Armaments Directors (CONAD)
established in 1966 to direct cooperative armaments research,
development and production programs in support of the
Armaments requirements of NATO countries.

7. ABCA Agreements

- 7.1 These agreements between the armies of U.S., Britain,
Canada and Australia provide for cooperation in the standardi-
zation of military equipment. The Department of Industry,

Trade and Commerce/IDPB keeps close watch on the work of committees administering these agreements in order that potential Canadian development and production can be exploited. Currently, one of the most important ABCA Agreements is for the development of the "Mallard" secure communications system.

Appendix E

12 ELIZABETH II.

CHAP. 3

An Act respecting the Department of Industry.

[Assented to 22nd July, 1963.]

HER Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

SHORT TITLE.

1. This Act may be cited as the *Department of Industry Act*. Short title

INTERPRETATION.

2. In this Act,
- | | |
|---|--------------------------|
| (a) "Agency" means the Area Development Agency referred to in section 12; | Definitions
"Agency." |
| (b) "Commissioner" means the Commissioner for Area Development; | "Commissioner." |
| (c) "Department" means the Department of Industry; | "Department." |
| (d) "Deputy Commissioner" means the Deputy Commissioner for Area Development; | "Deputy Commissioner." |
| (e) "designated area" means any district or locality in Canada designated by the Governor in Council pursuant to section 9; and | "Designated area." |
| (f) "Minister" means the Minister of Industry. | "Minister" |

PART I.

DEPARTMENT CONSTITUTED.

3. (1) There shall be a department of the Government of Canada called the Department of Industry, over which the Minister of Industry appointed by Commission under the Great Seal of Canada shall preside. Department constituted.
- (2) The Minister has the management and direction of the Department and holds office during pleasure. Management.

2

Chap. 3.

Department of Industry.

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Deputy
Minister

4. The Governor in Council may appoint an officer called the Deputy Minister of Industry, to be the deputy head of the Department and to hold office during pleasure.

Temporary
appoint-
ments.

5. (1) The Governor in Council may appoint persons having special knowledge of any manufacturing industry to advise and assist the Minister in the work of the Department, at such salaries and upon such other terms and conditions as the Governor in Council sees fit, including payment of a share of pension contributions or premiums under any benefit plan of which such persons are members.

Termination
of temporary
appoint-
ments.

(2) No person appointed pursuant to subsection (1) shall continue to be so employed after the 31st day of December, 1964.

Duties,
powers
and functions
of Minister.

6. The duties, powers and functions of the Minister extend to and include all matters relating to manufacturing industries in Canada over which the Parliament of Canada has jurisdiction, not by law assigned to any other department, branch or agency of the Government of Canada.

Further
duties.

7.

The Minister shall

- (a) cause the Department to acquire a detailed knowledge of manufacturing industries in Canada;
- (b) promote the establishment, growth, efficiency and improvement of manufacturing industries in Canada; and
- (c) develop and carry out such programs and projects as may be appropriate
 - (i) to assist the adaptation of manufacturing industries to changing conditions in domestic and export markets, and to changes in the techniques of production,
 - (ii) to identify and assist those manufacturing industries that require special measures to develop an unrealized potential or to cope with exceptional problems of adjustments, and
 - (iii) to promote the development and use of modern industrial technology in Canada and improve the effectiveness of the participation by the Government of Canada in industrial research.

8. In addition to the duties, powers and functions conferred by sections 6 and 7, the Minister shall exercise and perform all the duties, powers and functions vested in or required to be exercised and performed by the Minister of Defence Production notwithstanding anything contained in the *Defence Production Act*.

Minister to exercise and perform duties, powers and functions of Minister of Defence Production.

PART II.

AREA DEVELOPMENT.

9. The Governor in Council may designate as a designated area for the purposes of this Act any district or locality in Canada that is determined to require special measures to permit economic development or industrial adjustment by reason of the exceptional nature or degree of unemployment in that area.

Designated area.

10. The powers and duties of the Minister in relation to the Agency referred to in section 12 shall include

Powers and duties of Minister in relation to Agency.

- (a) the undertaking of research and the making of investigations respecting the means of increasing employment and income in designated areas; and
- (b) the preparing and carrying out of such programs and projects to improve the economic development of designated areas as may be appropriate to the purposes of this Part and that cannot suitably be undertaken by other departments, branches or agencies of the Government of Canada.

11. Subject to any existing statutory provision, the Governor in Council may authorize and direct departments, branches and agencies of the Government of Canada to undertake in the execution of their respective duties and functions such special measures as may be appropriate to facilitate the economic development of any designated area or the adjustment of industry in that area.

Powers of Governor in Council.

12. (1) There shall be established an Area Development Agency under the direction of a Commissioner for Area Development, who, together with a Deputy Commissioner for Area Development, shall be appointed by the Governor in Council to hold office during pleasure.

Establishment of Area Development Agency

(2) The Commissioner and Deputy Commissioner shall be paid such salaries as are fixed by the Governor in Council.

Salaries of Commissioner and Deputy Commissioner.

Commissioner
chief
executive
officer
and respon-
sible to
Minister.
Absence, etc.,
of Commis-
sioner

13. (1) The Commissioner is the chief executive officer of the Agency and is responsible to the Minister for the work of the Agency.

(2) If the Commissioner is absent or unable to act or if the office is vacant, the Deputy Commissioner has and may exercise all the powers and functions of the Commissioner.

PART III.

GENERAL.

General
authority
of Minister.

14. The Minister, in exercising his powers and carrying out his duties and functions under this Act,

- (a) shall, where appropriate, make use of the services and facilities of other departments, branches or agencies of the Government of Canada;
- (b) may, with the approval of the Governor in Council, enter into agreements with the government of any province or any agency thereof for the carrying out of programs for which he is responsible, and any such agreement shall be laid before Parliament within fifteen days after the execution thereof if Parliament is then sitting or, if Parliament is not then sitting, on any of the first fifteen days next thereafter that Parliament is sitting; and
- (c) may consult with, and organize conferences of, representatives of industry and labour, provincial and municipal authorities and other interested persons.

Establish-
ment of
advisory
committees.

15. The Governor in Council may establish advisory and other committees to advise or aid the Minister or to perform such duties and exercise such powers as the Governor in Council may specify, and may fix the remuneration and expenses to be paid to the persons so appointed.

Annual
report.

16. The Minister shall, on or before the 31st day of January next following the end of each fiscal year or, if Parliament is not then sitting on any of the first five days next thereafter that Parliament is sitting, submit to Parliament a report showing the operations of the Department for that fiscal year.

1953-54, c. 21.

17. Section 4 of the *Salaries Act* is amended by adding thereto the following:

"The Minister of Industry.....15,000."

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18. Schedule A to the *Financial Administration* R.S., c. 116
Act is amended by adding thereto the following:

“Department of Industry.”

19. This Act shall come into force on a day to Coming into
be fixed by proclamation of the Governor in Council. force

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1963

Appendix F

14-15-16 ELIZABETH II.

CHAP. 82

An Act to provide general incentives to industry for the expansion of scientific research and development in Canada and to effect certain related amendments to the Income Tax Act.

[Assented to 10th March, 1967.]

HER Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

SHORT TITLE.

1. This Act may be cited as the *Industrial Research and Development Incentives Act*. Short title.

INTERPRETATION.

2. (1) In this Act,
- | | |
|---|--|
| (a) "applicant" means a corporation that has applied for a grant; | Definitions.
"Applicant." |
| (b) "application" means an application for a grant; | "Applica-
tion." |
| (c) "approved" means approved by the Minister; | "Approved." |
| (d) "average of eligible current expenditures" by a corporation in its base period means an amount calculated in accordance with section 7; | "Average of
eligible
current expen-
ditures." |
| (e) "base period" of a corporation has the meaning assigned by section 6; | "Base
period." |
| (f) "corporation" means a corporation incorporated in and carrying on business in Canada, other than a corporation that is exempt from tax under Part I of the <i>Income Tax Act</i> by section 62 of that Act; | "Corpo-
ration." |
| (g) "eligible current expenditures" by a corporation in a fiscal period means an amount calculated in accordance with section 5; | "Eligible
current
expendi-
tures." |

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- "Fiscal period." (h) "fiscal period" in respect of a corporation has the same meaning as in the *Income Tax Act*;
- "Grant." (i) "grant" means a scientific research and development grant under this Act;
- "Grant period." (j) "grant period" means the fiscal period of an applicant in respect of which an application is made;
- "Minister." (k) "Minister" means the Minister of Industry; and
- "Regulation." (l) "regulation" means a regulation made by the Governor in Council pursuant to section 14.
- Associated corporations. (2) For the purposes of this Act, two or more corporations shall be deemed to be or to have been associated with each other in a fiscal period if, for the purpose of section 39 of the *Income Tax Act*, the corporations are or were, as the case may be, associated with each other in that period.
- Other expressions. (3) A reference in this Act
- (a) to a fiscal period or a grant period ending in a calendar year, means the fiscal period or the grant period, as the case may be, ending in or coinciding with that year;
 - (b) to a fiscal period ending in a grant period, means a fiscal period coinciding with that grant period or the fiscal period ending first in the same calendar year as that grant period; and
 - (c) to expenditures on or for scientific research and development, includes only expenditures incurred for and wholly attributable to the prosecution of or the provision of facilities for the prosecution of scientific research and development in Canada and such other expenditures attributable to the prosecution of or the provision of facilities for the prosecution of scientific research and development in Canada as may be prescribed by regulation.

SCIENTIFIC RESEARCH AND DEVELOPMENT GRANTS.

Scientific research and development grant authorized.

3. (1) Upon application therefor to the Minister by a corporation that has made expenditures on scientific research and development in a fiscal period of the corporation, the Minister may, subject to this Act and the regulations, authorize the payment to the corporation of a scientific research and development grant in respect of those expenditures.

Research and development likely to benefit Canada.

(2) No expenditure by a corporation in respect of scientific research and development shall be taken into account for the purposes of any provision of this Act unless the Minister, on the basis of such information as is sub-

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mitted to him pursuant to this Act and such other information as he considers relevant, is satisfied that the scientific research and development in respect of which the expenditure was made is likely to result in benefit to Canada if it is successful, and, where the Minister is not so satisfied,

- (a) no amount paid to the corporation in respect of such scientific research and development, and
- (b) no property acquired by the corporation for the purposes of such scientific research and development,

shall be taken into account for the purposes of any provision of this Act.

(3) An application under subsection (1)

Application.

(a) shall be made within

- (i) the six months next following the end of the applicant's grant period,
- (ii) where the applicant was associated in its grant period with another corporation, the six months next following the end of the fiscal period of the other corporation ending in the grant period,
- (iii) where the applicant was associated in its grant period with two or more other corporations, the six months next following the end of the last of the associated corporations' fiscal periods ending in the grant period, or
- (iv) the six months next following the day on which this Act comes into force,

whichever period ends last;

(b) shall contain such information as is specified by a regulation made under paragraph (c) of section 14 and as may be prescribed by the Minister; and

(c) shall be in such form and be certified in such manner as may be prescribed by the Minister.

(4) If the Minister is satisfied that circumstances not reasonably within the control of a corporation justify an extension of the period fixed by paragraph (a) of subsection (3) within which an application by the corporation shall be made, he may extend the period, either before or after the expiration thereof.

Extension of time.

CALCULATION OF GRANT.

4. (1) A grant authorized by the Minister to be paid to an applicant, other than an applicant referred to in

Amount of grant.

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subsection (2), shall be an amount equal to 25% of the aggregate of

- (a) the capital expenditures by the applicant in its grant period on scientific research and development related to the business and directly undertaken by or on behalf of the applicant; and
- (b) the amount by which the eligible current expenditures by the applicant in its grant period exceeds the average of eligible current expenditures by the applicant in its base period.

Associated corporations.

(2) Where an applicant was associated with one or more other corporations in the applicant's grant period, a grant authorized by the Minister to be paid to the applicant shall be an amount equal to 25% of the aggregate of

- (a) the capital expenditures by the applicant in its grant period on scientific research and development related to the business and directly undertaken by or on behalf of the applicant; and
- (b) where
 - (i) the eligible current expenditures by the applicant in its grant period exceed the average of eligible current expenditures by the applicant in its base period (the amount of which excess is hereinafter referred to as "the applicant's increase"), and
 - (ii) the aggregate of
 - (A) the eligible current expenditures by the applicant in its grant period, and
 - (B) the total of the eligible current expenditures by each of the corporations associated with the applicant in its grant period, in the fiscal periods of the associated corporations ending in the grant period,
 exceeds the aggregate of
 - (C) the average of eligible current expenditures by the applicant in its base period, and
 - (D) the total of the averages of eligible current expenditures by each of the corporations whose eligible current expenditures are required to be included for the purposes of clause (B), in the base periods of those corporations

(the amount of which excess is hereinafter referred to as "the association's increase"), that proportion of the association's increase that the applicant's increase is of the aggregate of

- (iii) the applicant's increase, and
- (iv) where the eligible current expenditures by any corporation associated with the applicant in its grant period, in the fiscal period of the associated corporation ending in the grant period, exceed the average of eligible current expenditures by the associated corporation in its base period, the total of the amounts of such excesses for each of the corporations associated with the applicant in its grant period.

(3) Notwithstanding subsection (1) or (2), where an applicant was associated in any fiscal period included in its base period with a corporation Where associated in base period only.

- (a) with which the applicant was not associated in its grant period, and
- (b) in respect of which all or substantially all the business that was carried on by that corporation in its last fiscal period before such association ended was acquired in any manner whatever by
 - (i) the applicant,
 - (ii) one or more corporations associated with the applicant in the applicant's grant period, or
 - (iii) by the applicant and one or more corporations described in subparagraph (ii),

an amount equal to one-fifth of the eligible current expenditures by that corporation in any of its fiscal periods ending in any such fiscal period of the applicant in which the applicant and that corporation were associated shall be added,

- (c) for the purposes of paragraph (b) of subsection (1), to the average of eligible current expenditures by the applicant in its base period, or
- (d) for the purposes of subparagraph (ii) of paragraph (b) of subsection (2), to the aggregate of the amounts determined pursuant to clauses (C) and (D) of that subparagraph,

whichever is applicable.

- (4) No capital expenditure in respect of
 - (a) land upon which movable or immovable property is or may be situated, Expenditures not included.

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- (b) any property that is acquired by the applicant in its grant period and that
 - (i) is sold or otherwise disposed of by the applicant,
 - (ii) ceases to be used by the applicant for the purposes of scientific research and development, or
 - (iii) is lost or destroyed in the grant period, or
 - (c) the replacement or repair of lost, damaged or destroyed property, other than property to which paragraph (b) applies, where an amount has been paid or is payable under a policy of insurance in respect of the loss, damage or destruction and no amount has become payable by the applicant to Her Majesty by virtue of section 10 in respect thereof,
- shall be included for the purposes of this section, and no expenditure
- (d) that in the opinion of the Minister is not reasonable in the circumstances, or
 - (e) that is made wholly or mainly to acquire rights in or arising out of scientific research,
- shall be included for the purposes of this section or section 5.

DETERMINATION OF ELIGIBLE CURRENT EXPENDITURES.

Eligible
current
expenditures.

- 5.** (1) The eligible current expenditures by a corporation in a fiscal period of the corporation is an amount equal to
- (a) the aggregate of the current expenditures in Canada by the corporation in the fiscal period
 - (i) on scientific research and development related to the business and directly undertaken by or on behalf of the corporation,
 - (ii) by way of payments
 - (A) to an approved association, university, college, research institute or other similar institution,
 - (B) to a company incorporated in and resident in Canada and exempt from tax under Part I of the *Income Tax Act* by paragraph (gc) of subsection (1) of section 62 of that Act, or
 - (C) to another corporation,
- for scientific research and development related to the class of business of the corporation, and

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- (iii) by way of repayments to Her Majesty of or on account of amounts paid to the corporation under an *Appropriation Act* and on terms and conditions approved by Treasury Board for the purpose of advancing or sustaining the technological capability of Canadian manufacturing or other industry,

minus the aggregate of

- (b) any amount paid to the corporation in the fiscal period in respect of scientific research and development, other than an amount paid as a grant under this Act;
- (c) subject to any regulation made under paragraph (e) of section 14, where property acquired by the corporation for the purposes of scientific research and development, and in respect of the acquisition of which a current expenditure was made by the corporation,
 - (i) is sold or otherwise disposed of by the corporation,
 - (ii) ceases to be used by the corporation for the purposes of scientific research and development, or
 - (iii) is lost or destroyed,
 in the fiscal period, an amount prescribed by regulation; and
- (d) subject to any regulation made under paragraph (f) of section 14, where the corporation in the fiscal period sells or otherwise disposes of goods or services in the production or performance of which property acquired by the corporation for the purposes of scientific research and development is utilized, an amount prescribed by regulation.

(2) Notwithstanding subsection (1), where, in determining the eligible current expenditures by a corporation in a fiscal period in accordance with subsection (1), the aggregate of all amounts described in paragraphs (b) to (d) of that subsection exceeds the aggregate of the current expenditures described in paragraph (a) thereof,

- (a) the eligible current expenditures by the corporation in that fiscal period shall be deemed to be zero; and
- (b) where the eligible current expenditures by the corporation in that fiscal period are required to be included for the purposes of clause (B) of subparagraph (ii) of paragraph (b) of subsection (2) of section 4, the total referred to in the said

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clause (B) shall be reduced by the amount of such excess.

Scientific research and development related to a business.

(3) References in this section to scientific research and development relating to a business or class of business include any scientific research and development that may lead to or facilitate an extension of that business or business of that class.

BASE PERIOD.

Base period.

6. (1) Subject to this section, the base period
- (a) of an applicant is the five fiscal periods of the applicant immediately preceding its grant period; and
- (b) of a corporation associated with the applicant in its grant period is the five fiscal periods of the associated corporation immediately preceding its fiscal period ending in the grant period.
- (2) Where any of the five fiscal periods
- (a) of an applicant, or
- (b) of a corporation associated with the applicant in its grant period,

Base period fiscal periods less than 365.

referred to in subsection (1) is less than 365 days, the base period of the applicant or the associated corporation, as the case may be, is the minimum number of consecutive fiscal periods thereof, immediately preceding the grant period or the fiscal period ending in the grant period, as the case may be, necessary to comprise at least 1,826 days.

Deemed to have fiscal periods.

(3) Where the applicant or a corporation associated with the applicant in its grant period has had no fiscal periods or an insufficient number of fiscal periods to constitute a base period within the meaning of subsection (1) or (2) the applicant or that corporation, as the case may be, shall be deemed to have had a number of added fiscal periods sufficient to constitute a base period within the meaning of subsection (1) or (2), but the eligible current expenditures of the applicant or that corporation, as the case may be, in any such added fiscal period shall be deemed to be zero.

DETERMINATION OF AVERAGE OF ELIGIBLE CURRENT EXPENDITURES IN BASE PERIOD.

Average of eligible current expenditures.

7. (1) Subject to this section, the average of eligible current expenditures by a corporation in its base period is an amount equal to one-fifth of the aggregate of the eligible current expenditures by the corporation in the fiscal periods of the corporation included in its base period.

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(2) Where the total number of days in the base period of a corporation is greater than 1,827, the amount determined under subsection (1) shall be reduced by an amount equal to one-fifth of that proportion of the eligible current expenditures by the corporation in the earliest fiscal period of the corporation included in its base period that the number of days in its base period in excess of 1,827 is of 365.

Amount subtracted.

(3) Where an applicant's grant period or, in the case of a corporation associated with the applicant in its grant period, the fiscal period of such corporation ending in the grant period is less than 365 days, the average of eligible current expenditures, calculated in accordance with subsections (1) and (2), by the applicant or the associated corporation, as the case may be, shall be reduced by that proportion thereof that the number of days by which the grant period or the fiscal period, as the case may be, is less than 365 days is of 365 days.

Grant period or fiscal period less than 365 days.

PAYMENT OF GRANTS.

8. (1) Subject to subsection (2), an amount authorized by the Minister to be paid to an applicant as a grant shall be paid to the applicant by the Minister of Finance out of the Consolidated Revenue Fund.

Payment out of Consolidated Revenue Fund.

(2) Where an applicant, in the manner prescribed by the Minister, requests the Minister to credit towards the payment of income tax all or any part of any amount authorized to be paid to the applicant as a grant, that amount or that part thereof shall, on the requisition of the Minister and in lieu of the payment thereof to the applicant as provided under subsection (1), be paid to the Receiver General by the Minister of Finance as a payment on account of income tax that is or may become payable by the applicant under the *Income Tax Act*.

Payment on account of tax liability.

TAX PROVISIONS.

9. (1) An amount authorized to be paid to an applicant as a grant is exempt from income tax.

Grant exempt from income tax.

(2) Paragraph (h) of subsection (6) of section 20 of the *Income Tax Act* does not apply in respect of a grant authorized to be paid under this Act.

Grant does not reduce capital cost for tax purposes.

RECOVERY OF GRANT.

10. (1) Subject to subsection (2), where a grant has been authorized to be paid to a corporation in respect of a

Recovery of grant by Crown in certain circumstances.

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capital expenditure made in respect of the acquisition of property that

- (a) is sold or otherwise disposed of by the corporation,
- (b) is lost, damaged (by other than normal wear and tear) or destroyed, or
- (c) ceases to be used by the corporation for the purposes of scientific research and development

within a period described in one of the following paragraphs that is applicable to that property, the amount specified in that paragraph immediately becomes payable by the corporation to Her Majesty, namely:

- (d) within one year from the end of the fiscal period in which the property was acquired, an amount equal to 100% of the grant or grants authorized to be paid to the corporation in respect of all capital expenditures made by the corporation in respect of the acquisition of the property;
- (e) in the case of equipment, after the termination of the year referred to in paragraph (d) but within five years from the end of the fiscal period in which it was acquired, an amount equal to
 - (i) the amount described in paragraph (d), minus
 - (ii) one-fifth of that amount for each full year or portion of a year that has elapsed since the end of the year referred to in paragraph (d); and
- (f) in the case of property other than equipment, after the termination of the year referred to in paragraph (d) but within ten years from the end of the fiscal period in which it was acquired, an amount equal to
 - (i) the amount described in paragraph (d), minus
 - (ii) one-tenth of that amount for each full year or portion of a year that has elapsed since the end of the year referred to in paragraph (d).

Idem.

(2) Where the property described in subsection (1) is property that was lost, damaged (by other than normal wear and tear) or destroyed, no amount becomes payable to Her Majesty by virtue of subsection (1) unless an amount payable under a policy of insurance in respect of the loss, damage or destruction has not, within one year from the end of the fiscal period in which the property was lost, damaged or destroyed or such further period as the Minister may in writing allow, been expended on replacing or re-

pairing the property and, in that case, an amount determined in accordance with subsection (1) becomes payable to Her Majesty immediately upon the termination of that year or any further period allowed in writing by the Minister.

(3) Every amount

- (a) that becomes payable by a corporation by virtue of this section, or
- (b) that has been paid or credited to a corporation as or on account of a grant, and to which the corporation is not entitled,

Manner of recovery of amounts owing.

may be recovered at any time as a debt due to Her Majesty or may be retained, in whole or in part, by the Minister of Finance out of any grant subsequently authorized to be paid to the corporation.

GENERAL.

11. (1) Notwithstanding any provision of the *Income Tax Act*, the Minister of National Revenue or any person designated by him for the purpose may, upon the request of the Minister, advise the Minister

Minister of National Revenue may give advice.

- (a) whether an applicant is or was associated in its grant period or in its base period with any other corporation;
- (b) whether any particular expenditure of a corporation is a capital or current expenditure;
- (c) as to the duration of any fiscal period of a corporation; and
- (d) whether a corporation is exempt from tax under Part I of the *Income Tax Act* by section 62 or any provision of section 62 of that Act;

and may give the Minister such information as is necessary for the purposes of any regulation made under paragraph (h) of section 14.

(2) Any advice or information that may be given to the Minister pursuant to subsection (1) may be given to any officer or employee employed by Her Majesty in connection with the administration or enforcement of this Act who is designated by the Minister for the purpose.

Advice may be given to designated employee.

12. The Minister may

- (a) obtain the advice of any agency or department of the Government of Canada carrying on activities in the field of scientific research and development on whether any particular activity constitutes scientific research and development;
- (b) obtain the advice of the Department of Trade and Commerce on whether any particular

Minister may obtain and give advice.

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scientific research and development is likely to result in benefit to Canada if it is successful; and

- (c) advise the Minister of National Revenue as to whether a corporation has been authorized to be paid a grant in respect of expenditures on scientific research and development in a fiscal period.

Information privileged.

13. All information with respect to a corporation obtained by an officer or employee of Her Majesty in the course of the administration of this Act is privileged, and no such officer or employee shall knowingly, except as may be necessary for the purposes of sections 11 and 12 or in respect of proceedings relating to the administration or enforcement of this Act, communicate or allow to be communicated to any person not legally entitled thereto any such information or allow any such person to inspect or have access to any application or other writing containing any such information.

REGULATIONS.

Regulations.

14. The Governor in Council may make regulations providing for any matters concerning which he deems regulations are necessary to carry out the purposes and provisions of this Act and, without limiting the generality of the foregoing, may make regulations

- (a) prescribing or defining anything that by this Act is to be prescribed or defined by regulation;
- (b) defining the expressions "capital expenditure", "current expenditure", "equipment" and "scientific research and development";
- (c) specifying information that shall be provided by a corporation for the purposes of subsection (2) of section 3;
- (d) prescribing factors that shall or shall not be taken into account by the Minister in deciding whether an expenditure was made in respect of scientific research and development that is likely to result in benefit to Canada if it is successful and the conclusions or inferences, if any, to be drawn from any particular factor;
- (e) prescribing circumstances in which no amount need be subtracted pursuant to paragraph (c) of subsection (1) of section 5 where property described in that paragraph is sold or otherwise disposed of, ceases to be used for the purposes of scientific research and development or is lost or destroyed;

- (f) prescribing circumstances in which no amount need be subtracted pursuant to paragraph (d) of subsection (1) of section 5 upon the sale or other disposition of goods or services described in that paragraph;
- (g) prescribing the amounts that shall be subtracted pursuant to paragraph (c) or (d) of subsection (1) of section 5;
- (h) prescribing, notwithstanding section 5, the circumstances and manner in which information submitted to the Minister of National Revenue for the purposes of section 72 or 72A of the *Income Tax Act* may or shall be used in determining the eligible current expenditures of a corporation;
- (i) prescribing the books and records to be kept by any corporation that has applied for or received a grant and by any corporation associated with such corporation;
- (j) providing for the examination, audit and copying of the books, records and property of any corporation that has applied for or received a grant and of any corporation associated with such corporation;
- (k) providing for the disclosure to the Minister by a corporation by which an amount has become payable to Her Majesty by virtue of section 10 of such information as may be necessary for the enforcement of that section;
- (l) specifying, either generally or in respect of a particular provision of this Act, the circumstances in which property shall be deemed to be or not to be acquired for the purposes of scientific research and development;
- (m) specifying, either generally or in respect of a particular provision of this Act, the circumstances in which a corporation shall be deemed to cease or not to cease using property for the purposes of scientific research and development; and
- (n) either generally or in respect of a particular provision of this Act, respecting the day on which any property in respect of the acquisition of which a capital or current expenditure has been made by a corporation shall be deemed to have been acquired by the corporation.

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OFFENCES.

- Offences. **15.** (1) Every person who,
- (a) in respect of an application for a grant, knowingly makes a false or misleading statement in or fails to disclose a material particular in any application or other document or wilfully furnishes any false or misleading information is guilty of
 - (i) an indictable offence and liable to imprisonment for a term not exceeding two years, or
 - (ii) an offence and liable on summary conviction to a fine not exceeding \$5,000;
 - (b) contravenes or fails to comply with any regulation made under paragraph (i) or (j) of section 14 is guilty of an offence and liable on summary conviction to a fine not exceeding \$1,000; and
 - (c) fails to comply with a regulation made under paragraph (k) of section 14 is guilty of an offence and liable on summary conviction to a fine not exceeding \$100 for each day of default and not exceeding in all \$5,000.
- Idem. (2) Every officer or employee of Her Majesty who contravenes section 13 is guilty of an offence punishable on summary conviction.
- Institution of prosecution. (3) A prosecution by way of summary conviction for an offence under subsection (1) may be instituted at any time within five years from the time when the subject matter of the complaint arose.

APPLICATION OF ACT.

- Application of Act. **16.** This Act is applicable to expenditures on scientific research and development in any fiscal period of a corporation ending in the calendar year 1966 or any subsequent calendar year.

ANNUAL REPORT.

- Annual report to Parliament. **17.** The Minister shall as soon as possible after the end of each fiscal year prepare a report on the administration of this Act during that fiscal year and shall cause such report to be laid before Parliament forthwith upon the completion thereof or, if Parliament is not then sitting, on any of the first fifteen days next thereafter that Parliament is sitting.

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AMENDMENTS TO INCOME TAX ACT.

18. (1) Subsection (2) of section 72 of the *Income Tax Act* is repealed and the following substituted therefor:

“(2) The Minister may obtain the advice of the Department of Industry, the National Research Council, the Defence Research Board or any other agency or department of the Government of Canada carrying on activities in the field of scientific research as to whether any particular activity constitutes scientific research.”

Minister
may obtain
advice.

(2) Paragraph (a) of subsection (4) of section 72 of the said Act is repealed and the following substituted therefor:

“(a) “approved” means approved by the Minister after he has, if he considers it necessary, obtained the advice of the Department of Industry or the National Research Council,”

(3) Subsections (1) and (2) are applicable to the 1966 and subsequent taxation years.

19. (1) Section 72A of the said Act is amended by adding thereto, immediately after subsection (4) thereof, the following subsection:

“(4a) Notwithstanding subsection (4), where property described in subsection (4) has been disposed of by a corporation in a taxation year, the amount that the corporation is required by that subsection to include in computing its income for that year shall be reduced by one-fifth of that amount for that year and each previous taxation year of the corporation ending after its 1967 taxation year.”

Idem.

(2) Section 72A of the said Act is further amended by adding thereto the following subsection:

“(7) Where a grant has been authorized to be paid to a corporation under the *Industrial Research and Development Incentives Act* in respect of expenditures on scientific research and development (as defined for the purposes of that Act) in a taxation year, the corporation is not, and shall be deemed never to have been, entitled to make any deduction under this section in computing its income for that year.”

No deduction
under this
section.

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(3) Subsection (1) is applicable to the 1968 and subsequent taxation years and subsection (2) is applicable to the 1966 and subsequent taxation years.

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1967

Appendix GPartial List of Industrial Missions to Foreign Countries
Sponsored by Department of Industry

- (1) Clothing Mission to Europe - to study production methods and technology of clothing industry (1962).
- (2) Leather Trade Mission to Europe - to study all aspects of leather industry (1962).
- (3) Fabric Trade Mission to Europe - to study methods of fabric production (1964).
- (4) Technical Wood Products Mission to the Western United States - to study advances in technology of wood products (1965).
- (5) Technical Mission to Europe - to study production methods and technology of Particleboard Industry (1965).
- (6) Footwear Technical Mission to Europe - to study methods of footwear production (1966).
- (7) Technical Mission to Europe - to study use of prefabricated structural ceramics in industrialized building (1966).
- (8) Technical Mission to Europe - to study powder metallurgy industry (1967).
- (9) Technical Mission to Italy - to analyse production techniques in the Electrical Major Appliance Industry (1967).
- (10) Technical Mission to Europe - to study use of prefabricated concrete components in industrialized building (1967).
- (11) Technical Mission to Scandinavia - to study techniques used in Chemical Pulp Industry.

Regional Pattern of ExpendituresTable 1. PAIT Support by Province

	<u>Total Estimated Cost</u>	<u>Total Crown Support</u>	<u>Actual Expenditure to date</u>
		\$ 000	
Nova Scotia	877	438	87
New Brunswick	581	290	188
Quebec	22,681	11,315	7,190
Ontario	14,182	8,119	4,553
Saskatchewan	264	132	119
Alberta	1,775	887	808
British Columbia	<u>3,766</u>	<u>1,883</u>	<u>859</u>
TOTAL	<u>\$ 44,126</u>	<u>\$ 23,064</u>	<u>\$ 13,804</u>

Table 2. IRDIA Applications (1967) by Province

	<u>Grant Authorized</u>
	\$ 000
Nova Scotia	108
New Brunswick	7
Quebec	2,494
Ontario	2,036
Manitoba	62
Alberta	229
British Columbia	<u>304</u>
TOTAL	<u>\$ 5,240</u>

Appendix HTable 3. DIP (Development only) Support by Province

	<u>Total Funds</u>	<u>Canadian Gov't. Funds</u>
	\$ 000	
Newfoundland	335	230
Nova Scotia	4,360	1,829
Quebec	220,179	113,366
Ontario	105,291	55,516
Manitoba	6,886	5,773
Alberta	1,083	496
British Columbia	<u>270</u>	<u>135</u>
TOTAL	<u>\$ 338,404</u>	<u>\$ 177,345</u>

Table 4. DIP (IMDE only) Support by Province

	<u>Can. Gov't Funds</u>
	\$ 000
Nova Scotia	40
Quebec	14,932
Ontario	7,747
Manitoba	530
Alberta	<u>71</u>
TOTAL	<u>\$ 23,321</u>

Appendix I

TABLE I

Personnel Establishment, Department of Industry, Trade & Commerce

<u>PROGRAM</u>	<u>ESTABLISHMENT</u> <u>1968-69</u>	<u>CONT.</u> <u>EMPLS.</u> (31/1/69)	<u>TERM</u> <u>EMPLS.</u>
<u>Administration Group</u>			
Executive			
Minister's Office	17	15	3
Deputy Minister	<u>25</u>	<u>17</u>	<u>2</u>
	42	32	5
Administration			
ADM (Admin.)	3	2	
Financial Services	60	44	2
Personnel	77	75	1
Prof. & Admin. Services	202	168	28
Program Analysis	<u>12</u>	<u>4</u>	<u>5</u>
	354	293	36
<u>Travel Development</u>			
Gen. Director's Office	2	2	
Office of Tourism	<u>292</u>	<u>250</u>	
	294	252	
<u>Industry & Trade Development</u>			
Sr. ADM (I. & T.D.)	6	5	
Design Adviser	47	35	11
Scientific & Techn. Adviser	<u>36</u>	<u>26</u>	<u>2</u>
	89	66	13
Secondments		<u>20</u>	
		86	
Operations Group			
ADM (Operations)	5	5	
Aerospace & Marine	67	64	7
Agric., Fish. & Food Products	75	69	4
Apparel & Textiles	48	36	2
Chemicals	57	50	3
Electrical & Electronics	92	69	8
Machinery	103	83	3
Materials	75	64	1
Mechanical Transport	54	42	5
Wood Products	63	54	1
Program Office - Operations	<u>22</u>	<u>18</u>	<u>1</u>
	661	554	35
Promotional Support Services			
General Director's Office	3	3	
Industry & Trade Publicity	83	79	6
Industry & Trade Services	127	115	4
Trade Fairs & Missions	<u>19</u>	<u>18</u>	<u>1</u>
	232	215	11
External Services			
ADM Office	4	3	
International Defence Program	103	88	6
Program Office	5	4	
Trade Commissioner Services	864	773	1
	(350-514)	(294-479)	
	<u>976</u>	<u>868</u>	<u>7</u>
SUB-TOTAL I.&T.D.	1958	1723	66
Trade & Industrial Policy			
ADM (Trade)	18	18	1
Area Relations	51	47	
General Relations	39	33	
Industrial Policy Adviser	<u>13</u>	<u>11</u>	<u>1</u>
	121	109	
Economics & Trade Analysis	92	71	8
World Exhibitions	0	9	1
<u>TOTALS</u>	2861	2489	117

TABLE 2

Country of Birth, Secondary Education, Bachelor Degree
of Professionals Having a Bachelor's Degree as a Final Degree

Bachelors' Final Degree	Country of Birth	Country of Secondary Education	Country of Bachelors' Degree
<u>Americas</u>			
Barbados	1	1	0
Canada	156	167	168
U.S.A.	4	3	10
<u>Europe</u>			
Belgium	1	1	0
Czechoslovakia	2	1	0
Germany	4	2	1
Greece	1	1	0
Poland	2	1	0
Spain	1	0	0
Switzerland	0	0	1
U.K.	23	21	18
<u>Asia</u>			
India	4	3	2
<u>Australia</u>	1	0	0
<u>New Zealand</u>	1	0	1
Total	201	201	201

Special Committee

TABLE 3

Country of Birth, Secondary Education, Bachelor Degree, Master Degree of Professionals Having a Master's Degree as a Final Degree

Masters' Final Degree	Country of Birth	Country of Secondary Education	Country of Bachelors' Degree	Country of Masters' Degree
<u>Americas</u>				
Canada	34	38	42	39
U.S.A.	1	0	0	5
West Indies	1	1	0	0
<u>Europe</u>				
Belgium	1	1	1	0
Czechoslovakia	1	1	0	0
Germany	1	0	0	0
Netherlands	1	0	0	0
U.K.	8	9	7	6
U.S.S.R.	2	1	1	1
<u>Asia</u>				
India	1	1	1	1
Pakistan	1	0	0	0
Total	52	52	52	52

TABLE 4

Country of Birth, Secondary Education, Bachelor Degree, Doctorate Degree of Professionals Having a Doctorate Degree as a Final Degree

Doctorate Final Degree	Country of Birth	Country of Secondary Education	Country of Bachelors' Degree	Country of Doctors' Degree
<u>Americas</u>				
Canada	5	5	6	7
U.S.A.	0	0	0	3
<u>Europe</u>				
Czechoslovakia	2	2	2	2
Germany	2	2	1	0
Hungary	1	1	1	1
Italy	1	1	1	0
Netherlands	2	2	2	1
U.K.	2	2	2	1
Total	15	15	15	15

TABLE 5

Average Age, Number of Working Years Since Graduation
and Number of Years Employed in DITC

	Bachelors'	Masters'	Doctorate
Average Age	41	36	47
Average no. of Years Employed since Graduation	19	14	19
Average no. Years Employed in DITC	5	4	3

TABLE 6

Official Languages Proficiency (Bilingualism)

	Bachelors'	Masters'	Doctorate
Percentage able to operate effectively in Canada's two official languages*	26	21	40

*Based on individuals assessment of their own capability

TABLE 7

Previous Employment by Degree

	Bachelors'	Masters'	Doctorate	Percentage of Total Professional Personnel*
Industry	136	40	12	70
University (Staff)	19	7	4	11
Provincial Departments or Agencies	13	7	0	8
Other Federal Agencies	86	43	6	50

*The percentages above equal more than 100% because of the fact
that some individuals have been employed by more than one sector.

TABLE 8

The Number of University Students Given
Summer Employment, 1962-1968

<u>Year</u>	<u>Department</u>	
	<u>Trade & Commerce</u>	<u>Industry</u>
1964	4	
1965	4	
1966	4	
1967	5	
1968	8	11

Appendix JExpenditures on Scientific ActivitiesTable 1. PAIT Support by Industry Group

	<u>Total Estimated Cost</u>	<u>Total Crown Commitments</u>	<u>Actual Expenditures</u>
		\$ 000	
Mines	\$ 3,536	1,768	974
Gas & Oil Wells	-	-	-
Food & Beverage	570	285	133
Rubber	23	12	7
Textiles	165	82	39
Wood	784	392	266
Furniture & Fixtures	96	48	17
Paper	1,319	659	50
Primary Metals			
- Ferrous	1,010	505	184
- Non Ferrous	1,829	914	297
Metal Fabricating	1,536	768	199
Machinery	4,999	2,473	1,355
Aircraft and Parts	11,299	5,646	4,780
Other Transportation Equipment	479	239	209
Electrical Products	8,094	4,905	2,848
Non-Metallic Mineral Products	570	285	103
Petroleum Products	-	-	-
Drugs and Medicine	218	109	43
Other Chemical Products	1,419	710	154
Scientific and Professional Instruments	997	673	486
Other Manufacturing	2,237	1,118	543
Transportation and Other Utilities	799	400	400
Other Non-Manufacturing	<u>2,147</u>	<u>1,074</u>	<u>716</u>
TOTAL	\$ 44,126	\$ 23,066	\$ 13,803

Table 2. IRDIA Support by Industry Group
For Companies With Fiscal Years Ending in 1967

	<u>Grant</u> <u>Applied For</u>	<u>Grant*</u> <u>Authorized</u> <u>to 31.12.68</u>
	\$ 000	
Mines	1,094	22
Oil and Gas Wells	268	33
Food and Beverage	1,300	972
Textiles	236	26
Wood and Furniture and Fixtures	331	73
Paper	2,529	100
Primary Metals Ferrous	798	nil
Primary Metals Non-Ferrous	3,569	nil
Metal Fabricating	533	151
Machinery	1,413	651
Aircraft and Parts	1,936	1,295
Other Transportation Equipment	160	92
Electrical Products	9,349	848
Non Metallic Mineral Products	233	43
Petroleum Products	3,386	13
Drugs and Medicine	685	190
Other Chemical Products, incl. Rubber	3,482	185
Scientific & Professional Instruments	424	146
Other Manufacturing	486	113
Transportation & Other Utilities	1,221	137
Other Non Manufacturing	259	149
Miscellaneous including unclassified, and companies no longer trading	<u>74</u>	<u>nil</u>
TOTAL	\$ 33,767	\$ 5,241

*The large difference between the grant applied for and the grant authorized can be explained by the fact that processing of application is not complete.

Appendix JTable 3. DIP (Development only) Support by Industry Group

	Total Funds	Canadian Government Funds
	\$ 000	
Mines	36	36
Primary Metals, non-Ferrous	246	123
Metal Fabricating	697	457
Aircraft and Parts	198,671	98,610
Other Transportation Equipment	5,626	4,628
Electrical Products	95,330	52,110
Non-Metallic Mineral Products	325	163
Scientific & Professional Instruments	28,307	16,307
Other Manufacturing	7	7
Other Non-Manufacturing	112	112
No longer trading	517	492
Universities, etc.	<u>8,528</u>	<u>4,300</u>
TOTAL	<u>\$ 338,404</u>	<u>\$ 177,345</u>

Table 4. DIP (IMDE only) Support by Industry Group

	Can. Gov't Funds
	\$ 000
Primary Metals, Ferrous	625
Primary Metals, Non-Ferrous	181
Metal Fabricating	2,156
Machinery	652
Aircraft and Parts	14,552
Other Transportation Equipment	545
Electrical Products	3,329
Other Chemical Products	40
Scientific & Professional Instruments	1,236
Other Manufacturing	<u>4</u>
TOTAL	<u>\$ 23,321</u>

Appendix KTypical Examples of Employment of Consultants

<u>Study</u>	<u>Consultants</u>	<u>Cost</u>
The R&D needs of the Canadian Furniture Industry	Wood Gordon & Co.	\$ 20,000
Information on optimum household furniture manufacturing facilities	Ross Associates Inc.	\$20,500
To recommend policy and action to improve performance and international competitiveness of the Major Appliance Industry, and to examine in depth the problem of economics of scale in production and marketing with respect to the Major Appliance Industry	University of Toronto	\$100,000
To analyse, with industry, the long term prospects for rationalisation and growth of aerospace activity in Canada	Arthur D. Little Kendall & Associates	\$100,000
An assessment of the satellite communications market over the 1970-1980 period which might be available to Canadian industry, and a technological forecast of the trends in telecommunications equipment as a result of satellite use	Acres Intertel	\$ 36,000

Appendix IExamples of University Research Support

The following grants have been paid to the Rapeseed Association of Canada for the following development projects to be conducted during the fiscal year 1968/69:

- 1) FEEDING VALUE OF RAPESEED MEALS AS DETERMINED BY BALANCE
AND OXYGEN METABOLISM STUDIES WITH MICE
by Professor J.M. Bell, University of Saskatchewan \$8,000
- 2) EVALUATION OF THE NUTRITIONAL QUALITY AND UNIFORMITY
OF RAPESEED MEAL
by Professor J. Biely and Professor B.E. March,
University of British Columbia 9,000
- 3) DETERMINATION OF DIGESTIBLE AND METABOLIZABLE
ENERGY, AND THE PROTEIN UTILIZATION OF SWINE
PED RAPESEED MEAL
by Professor J.P. Bowland, University of Alberta 6,000
- 4) FACTORS AFFECTING THE FEEDING VALUE OF RAPESEED
MEAL
by Professor D.R. Clandinin, University of Alberta 12,500
- 5) EVALUATION OF RAPESEED MEAL AS A PROTEIN SOURCE
by Professor D.C. Hill, University of Guelph 6,000
- 6) EVALUATION OF PROTEIN QUALITY OF RAPESEED
MEAL FOR SWINE
by Professor B.E. McDonald, University of Manitoba 4,720
- 7) DEVELOPMENT OF PROCESSES TO REDUCE THE FIBER
CONTENT OF RAPESEED MEAL
by Professor G. Kardos, McMaster University 12,510
- 8) EVALUATION OF RAPESEED MEAL:
EFFECT OF STEAM PELLETTING ON NUTRIENT AVAILABILITY
by Professor H.S. Bayley, University of Guelph 9,000
- 9) INVESTIGATION OF MINOR NON-GLYCERIDE CONSTITUENTS
IN RAPESEED OIL
by Professor B.L. Walker, University of Guelph 13,000

Appendix MProgram for the Advancement of Industrial Technology
(PAIT)1. Program Objectives

1.1 The basic objective of the PAIT Program is to promote the growth of efficient, competitive manufacturing and processing industries in Canada by providing risk capital for product and process development projects, the results of which will be marketed at home and abroad. The program is designed to place Canadian industry in a position comparable to its foreign competition which enjoys larger markets, a higher level of investment in new product development, and substantial government support for its research and development activities. By providing direct assistance for product and process innovation in all sectors of Canadian industry, the PAIT Program promotes product specialization and rationalization based on technical innovation and access to international markets.

2. Program Authority

2.1 Under the authority granted in Section 7 of the Department of Industry Act, a proposal for the establishment of the Program for Advancement of Industrial Technology was put before the Cabinet in early 1965. A Record of Cabinet Decision dated April 14, 1965, formally established the program. Detailed terms and conditions for the operation of the program were subsequently submitted to the Treasury Board and were approved in Treasury Board Minute 644962 dated August 30, 1965. Under this minute financial authority is delegated to the Deputy Minister.

3. Eligible Applicants

3.1 Assistance under the program is available to companies incorporated in Canada, to groups of companies organized as consortia, and to trade associations to the extent that they can satisfy the requirements of the program.

4. Qualifying Activities

4.1 PAIT assistance has been concentrated mainly on the engineering development phase of product and process innovation projects. Activities associated with the engineering development phase may be conducted either in-house or by subcontractors (firms, consultants, universities, research councils and foundations.)

5. Selection Criteria

5.1 Applicants

5.1.1 Applicant companies are assessed as to their technical and financial resources and facilities. The management, technical and marketing skills of the company, and the corporate characteristics, are of special interest. The applicant is expected to have the engineering, production and marketing capability necessary to plan and implement the development project and exploit the results in domestic and export markets. The technical capability of the applicant is evaluated on the basis of previous work in the field, the availability of qualified staff, or of arrangements for technical competence on a subcontract basis. Marketing skills are assessed on the basis of previous sales, the market survey, and the adequacy of the existing or planned marketing organization and distribution network. Corporate characteristics of interest are the record of past performance, the influence of foreign control, and any legal restrictions on access to international markets.

5.1.2 Regarding facilities, the applicant is expected to have the tools of the trade and equipment suitable for the conduct of the development project and follow-on manufacturing. If facilities are not adequate for these purposes, the applicant is required to outline firm plans on how he proposes to acquire them.

5.1.3 The financial status of the applicant is evaluated by analysis of audited financial statements for the past three years, submitted by him. Financial resources should be adequate to enable the company to carry out the project on a sound financial basis, and there should be a satisfactory accounting system. If additional capital is required to undertake the project, or to exploit it commercially, the means of raising this capital are determined and assessed.

5.2 Project

5.2.1 Projects are required to be based on sound scientific principles, to be technically feasible within the time and cost

limits of the project, and to be sufficiently advanced in performance to ensure that the developed product or process will be technically competitive by the time the marketing stage is reached. The main technical problems associated with the project should have been identified and the technical risks reduced to the practical minimum by the development plan proposed. A Statement of Work is drawn up and becomes part of the PAIT Assistance Agreement. The qualifications and experience of the technical personnel directly involved in the project should be adequate to perform the technical tasks outlined in the development plan.

5.2.2 In addition to the technical requirement, each project is evaluated for its commercial feasibility. A market analysis is required from the company, defining the total market in terms of the requirement (price reduction, improved performance, simplicity, reliability, etc.), prospective customers, growth of market, distribution problems, and competition. Particular attention is given to export possibilities, and the proposed marketing plan. Where price is a critical factor, a production cost analysis is required.

6. Form of Assistance

6.1 PAIT assistance is provided in the form of a conditional loan, which may be provided to qualifying applicants for up to 50% of the estimated cost of the project without reference to Treasury Board for contract authorization.

7. Allowable Costs

7.1 Capital Costs

7.1.1 The PAIT Program does not underwrite the costs of acquisition of buildings or general purpose capital equipment for research, development or production purposes. General purpose equipment is defined as equipment which has a useful life beyond the duration of the development project and can be utilized for purposes other than the development project without major modification or alteration, i.e., equipment which can be sold for more than scrap or salvage value or utilized for other

research and development purposes or for production purposes. However, during the period in which such equipment is used for research and development purposes related to the project, its operating costs including an allowance for depreciation expense is allowable. This costing policy is also applied to prototype plants where the complete facility is larger than is essential for research and development purposes.

7.2 Current Costs

7.2.1 Allowable current costs include direct labour (research, design, development, fabrication), direct materials (all material inputs essential to development and test), prototypes or pilot plants, reasonable overhead charges (apportionment of such indirect costs as supervision, rent or taxes, depreciation, power and light, heat and insurance - excluded are selling and financing costs), subcontracts and consultants, special test and laboratory equipment consumed during the project, and such other direct costs as patents and necessary travel related to the project.

8. Terms of Repayment

8.1 PAIT conditional loans must be repaid to the Crown with interest if the project is successful and the results are exploited commercially. Interest accrues from the dates of issue of payments to the company and is compounded annually as of March 31. The rate of interest is that prevailing at the time of negotiation of the formal repayment agreement with the company, this rate being established quarterly by the Department of Finance as the government's lending rate. Repayment to the Crown is normally on a royalty basis out of sales, but the company has the option of repaying the Crown with interest in a lump sum at any time. The company has up to ten years to repay the PAIT contribution to the development project.

8.2 In the event that the project is not successful or the market prospects do not warrant putting the results of the project into commercial use, then the project is terminated and the loan is forgiven, (becoming in effect a grant.)

9. Title to Results and Property

9.1 Under the PAIT Program, the title to all results and property (e.g. designs, inventions, patents, prototypes, equipment, etc.) vests in and remains with the company.

10. Obligations of Applicant

10.1 The PAIT applicant company undertakes that the product or process resulting from the project will be produced or used by the company in Canada and that the company will, within a reasonable period of time, exploit the results in accordance with sound industrial practice. In the event of non-exploitation, the Minister has the right of exercising remedies as specified in Clauses 5(2) and 10 of the General Terms of the PAIT Assistance Agreement.

10.2 The major condition imposed on the PAIT applicant company is the requirement not to transfer technical data or inventions, whether or not patented, methods and processes resulting from the project to any other government or to any person, company, partnership or firm outside of Canada for the purposes of production, without the prior consent of the Minister; and place the same restriction on any transfer it may make to another Canadian company, firm, partnership or person.

11. Administrative Procedures

11.1 Companies' applications for PAIT assistance are generally received in the PAIT Program Office where they are allocated to the appropriate line branch. Line branch officers examine the applications within the context of their knowledge of the industry. The PAIT Office also forwards a copy of the company's application to the Director (scientific) of the Office of Science and Technology who assigns the application to a Scientific Consultant for an appraisal of the technical content of the proposed project. The PAIT Office is instrumental in bringing together the line officer and the Scientific Consultant for a comprehensive evaluation of the applicant's eligibility for assistance. Applications are in narrative form and are expected to set out in detail the technical aspects of the project, the market prospects and marketing plan, the cost estimate, the financial resources of the company, and its R&D capability. The Scientific

Consultant is responsible for the technical appraisal, and the PAIT Office is held responsible for ensuring that all other aspects are compatible with the program criteria and program objectives before submission of the application to the PAIT Advisory Committee. Applications are sponsored before the Committee by the line Branch.

11.2 The PAIT Advisory Committee is an interdepartmental committee at the Assistant Deputy Minister level, and is chaired by the General Director of Science and Technology. The Committee is composed as follows:

Chairman:	General Director, Science and Technology
Members:	Assistant Deputy Minister - Operations IT&C
	Assistant Deputy Minister - Trade Policy IT&C
	Assistant Deputy Minister - External Services IT&C
	Assistant Deputy Minister - Finance
	Vice-President (Scientific) National Research Council
	Deputy Chairman (Scientific) Defence Research Board
Observers:	Science Secretariat
	Treasury Board
Secretary:	Director, PAIT Program Office

11.3 When an application for assistance is recommended for approval by the PAIT Advisory Committee, the PAIT Program Office raises a requisition to encumber funds from Vote 10, and processes it for the signature of the Deputy Minister or his designate (the final approval stage and authorization of funding). This action is required prior to the drawing up of a PAIT Assistance Agreement which is executed by an executive officer of the applicant company and by the Director of the line branch concerned.

11.4 Following Committee recommendation and Deputy Minister funding authorization, the line branch becomes responsible for the monitoring of the project regarding both technical progress and approval of payment of progress claims, in consultation as appropriate with the PAIT Office and the Scientific Consultant. The PAIT Office

monitors projects on a program basis, consolidating estimates, encumbering funds under Vote 10, and negotiating with the line branch either a termination agreement or a repayment agreement as appropriate at the conclusion of a project.

12. Expenditures

12.1 The Department expenditures on the program have been:

1965/66	428,218
1966/67	4,596,100
1967/68	6,364,904
Apr 1/68 - Dec 31/68	2,414,280
Total to Dec 31/68	13,803,503

13. Results and Achievements

13.1 Since the inception of the PAIT Program, 167 projects have been approved involving a total research and development expenditure of over \$49 million, of which the PAIT share is \$25.5 million. Thirty projects have been completed or terminated prior to completion. Twenty-one of these projects are expected to achieve sales. The remaining nine projects were failures either in a technical, marketing or financial sense.

13.2 The 21 successful projects to date involved a total PAIT expenditure of \$1,350,000. The 9 unsuccessful projects were terminated at a cost to the Crown of \$257,000. Since PAIT expenditures on successful projects will be repaid out of company sales, the net cost to the Crown is represented by the expenditure on unsuccessful projects, i.e. \$257,000. When the sales resulting from the 21 successful projects (\$92.3 million) are related to the cost of the unsuccessful projects (\$257,000), the sales/cost ratio is 360/1. Already, within one year of completion of the 21 successful projects, actual sales to December 31, 1968, are over 40 times the Crown's unrecoverable expenditure on the unsuccessful projects. To December 31, 1968, repayment agreements had been signed with 13 of the 21 successful companies, and the rest were under negotiation. Five companies are presently repaying out of production.

13.3 The 21 successful projects cover a broad spectrum of industrial innovation including electromagnetic mineral prospecting equipment, environmental control instrumentation, communications, electronic data display devices, automated equipment, industrial process control techniques, and woods harvesting equipment.

13.4 The criteria for evaluating the results of a project are related to the economically regenerative aspects of industrial R&D:

- sales of price and performance competitive products of unique Canadian design in large domestic and export markets; and
- value added as a measure of economic output and growth resulting from the project; and
- benefits such as increased employment, establishment of new capital facilities and equipment for manufacturing of the developed product, upgraded employment skills, and advanced management and marketing techniques related to product innovation as a factor in modern business enterprise

13.5 Typical case histories of some completed projects are given in Appendix U.

Industrial Research and Development Incentives Act1. Program Objectives

1.1 The primary objective of the Industrial Research and Development Incentives Act, which authorizes the Department's Industrial Research and Development Incentives program, is to induce Canadian corporations to expand scientific research and development likely to result in economic benefit to Canada. The specific objectives of the Act are:

- (a) to encourage an increased growth rate in industrial research and development by:
 - (i) inducing Canadian corporations to undertake new and expand existing scientific research and development programs, the results of which, if successful, will be exploited by the Corporations;
 - (ii) inducing Canadian corporations to provide well equipped facilities for such work.
- (b) to encourage the establishment of independent research and development laboratories, research associations and technical consulting services whose purpose is to provide specialized support services for industrial research and development;
- (c) to encourage greater co-operation between industry and universities on research related to industrial problems.

2. Program Authority

2.1 The authority for this program is the Industrial Research and Development Incentives Act, 14-15-16 Elizabeth II, Chapter 82 of the Statutes of Canada. The Act was assented to March 10, 1967. Industrial Research and Development Incentives Regulations were promulgated in Order-in-Council P.C. 1967-1048 dated May 25, 1967.

3. Eligible Applicants

3.1 The incentive is available to all taxable Canadian corporations carrying on business in Canada.

4. Qualifying Activities

4.1 The activities qualified under the Act are scientific research and development as defined in Section 2(2)(d) of the Regulations, which state: "Scientific research and development" means systematic investigation or search carried out in a field of science or technology by means of experiment or analysis, that is to say,

Appendix N4.1 Qualifying Activities - continued

- (i) basic research, namely, work undertaken for the advancement of scientific knowledge without a specific practical application in view,
 - (ii) Applied research, namely, work undertaken for the advancement of scientific knowledge with a specific practical application in view, and
 - (iii) development, namely, use of the results of basic or applied research for the purpose of creating new, or improving existing, materials, devices, products or processes,
- and where such activities are undertaken directly in support of scientific research and development, includes activities with respect to engineering or design, operations research, mathematical analysis or computer programming and psychological research, but does not include activities with respect to -
- (iv) market research or sales promotion,
 - (v) quality control or routine testing of materials, devices or products,
 - (vi) research in the social sciences or the humanities,
 - (vii) prospecting, exploring or drilling for or producing minerals, petroleum or natural gas,
 - (viii) the commercial production of a new or improved material, device or product or the commercial use of a new or improved process,
 - (ix) style changes, or
 - (x) routine data collection.

5. Form of Assistance

Assistance is provided in the form of tax free cash grants. At the request of the applicant company, a cheque will be forwarded to the Department of National Revenue as a credit on account of any income tax which is or may become payable under the Income Tax Act.

6. Allowable Costs6.1 Capital Costs

6.1.1 Grants will equal 25 per cent of capital expenditures made by an applicant for scientific research and development carried out in Canada during the grant year. These must be related to the business of the applicant and directly undertaken by or on behalf of the applicant.

6.2 Current Costs

6.2.1 Grants will be equal to 25 per cent of the increase of eligible current expenditures made by the applicant in Canada over the average of such expenditures in a base period consisting of the five immediately preceding years.

6.2 (continued)

6.2.2 The terms "capital expenditures" and "current expenditures" are defined in Section 2(2)(a) and (b) of the Regulations.

7. Terms of Repayment

7.1 The Act does not require repayments as such, but grants may be recovered in other instances if property for which a grant has been authorized is transferred from research and development use to some other use.

8. Title to Results and Property

8.1 The title of any results or property arising out of the program, e.g., designs, inventions, patents, prototypes, equipment, etc., remains with the Corporation.

9. Obligations of Applicant

9.1 A Corporation that applies for a grant shall certify, with respect to scientific research and development carried out, that was financed in whole or in part by the Corporation, that:

- (a) It is carrying out all such scientific research and development for the purpose of strengthening the business of the corporation or facilitating an extension of such business.
- (b) It is free to exploit in Canada the results of all such scientific research and development, and the corporation is free to exploit the results of all such scientific research and development in all export markets (where this is not possible, will state the countries to which the corporation is not free to export) and shall undertake to exploit the results of such scientific research and development in Canada, unless according to sound business judgment, it would be uneconomic to do so.

10. Administrative Procedures

10.1 A brief description of the administrative procedures, upon receipt of an application by the Program Office, is as follows:

- (a) The Line Branch or Branches are asked to prepare an assessment and recommendation concerning the scientific research and development and benefit to Canada aspects of the application.
- (b) The Program Office will examine the financial aspects of the application to determine the eligibility of particular costs and check the accuracy of the amounts claimed. All applications will be subject to discretionary post-payment audit by the Audit Services Branch, Office of the Comptroller

Appendix N

10.1 (b) (continued)

of the Treasury; pre-payment audits may be requested by the Program Office in consultation with Financial Services Branch.

- (c) The Line Branch or Branches will forward their assessments and recommendations to the Program Office who will review these assessments and recommendations in conjunction with the pre-payment audit (if any) and if necessary discussions will be held with the Line Branch or Branches concerned. If it appears necessary that further examination is necessary, the Program Office will seek the written opinions of staff advisers and other government departments or agencies, and if required further discussions will be held with the Line Branch or Branches. Following the Program Office recommendation and authorization the application will be forwarded to the Financial Services Branch for concurrence. Following this, the application will be passed to the General Director, Office of Science and Technology, or his delegated alternate for approval and signature.
- (d) In the case of major policy issues, applications may be referred to the IRDIA Policy Committee and then discussed with the Deputy Minister.
- (e) The General Director, Office of Science and Technology, will also obtain the concurrence of the Deputy Minister before rejecting applications.
- (f) The Financial Services Branch will arrange payment to the applicant or to the Department of National Revenue as a credit against Tax Liabilities.
- (g) The Program Office will notify the applicant, the Branch and the Department of National Revenue of the disposition of the application.

10.2 Administratively, a system has been provided for corporations to request a prior opinion as to eligibility under the Act, with regard to eligibility as research and development and benefit to Canada aspects. A procedure similar to that for an application is followed in handling a request for a prior opinion with the Department.

11. Expenditures

11.1 The actual disbursements were \$2,131,353 in fiscal 1967, and \$10,261,638 for the first nine months of fiscal 1968.

12. Results and Achievements

12.1 Generally speaking, industry has welcomed the program. Participation has been good. Applications for fiscal years ending in 1967 numbered 533. Applications for the 1968 company fiscal year are running 45% higher than 1967 applications did at this time last year. Of the 180 applications for 1968 received to date, 74 are from companies who did not make application in 1967.

12.2 The benefits payable with respect to given company fiscal years are closely in accord with the estimates made when the program was proposed. Actual expenditures have lagged as a result of delays on the passage of the legislation and the fact that most large companies did not submit their 1967 applications until the June 30, 1968 deadline. This, together with a decision to review each application carefully in the initial year of dealings with the company, has meant that the program is just beginning to reach the projected average monthly expenditure levels.

12.3 The administration has proceeded smoothly. About 5% of the applications assessed to date have been rejected in total. Reductions in the claims have averaged about 18%. Less than 5% of the assessments to date have been disputed, and all but one settled to the applicants' satisfaction.

Appendix 0The Defence Industry Productivity Program1. Program Objectives

1.1 The immediate objective is to develop and sustain the technological capability of Canadian industry for the purpose of defence export sales or civil export sales arising from that capability.

1.2 Such industrial capability is a means toward four main goals, two of which relate directly to national defence and constitute the initial and still valid aims of the Program:

- (a) To minimize cost of acquisition of equipment for DND (by making it possible to purchase abroad when necessary to achieve competitive prices); and,
- (b) To retain in Canada defence industrial capability for use by DND in servicing and maintaining its advanced equipment (by substituting the opportunity of defence export sales, in place of dependence on DND requirements).
- (c) To ensure maximum industrial benefit from the advanced technology and management techniques inherent in defence research, development and production by making possible competitive participation in foreign markets.
- (d) To support co-operative programs with our Allies in Military Research, Development and Production (the Production Sharing Program).

2. Program Authority

2.1 In its present form, the Program was given approval on 1st May, 1968, by a Cabinet Committee considering a "Memorandum to the Cabinet" dated 24th April, 1968, and entitled "Defence Industrial Development". This approval was later confirmed by Cabinet.

3. Eligible Applicants

3.1 To be eligible, companies must be identifiable as belonging to Canadian defence industry. This industry sector is defined as those companies or elements thereof which have or may develop a defence-oriented capability or capacity employing advanced management

engineering and technology directed to defence export sales or civil export sales which arise from the capability or capacity.

4. Qualifying Activities

4.1 Assistance under this Program includes product research, development, test, and evaluation and product and process innovation; tooling, manufacture of prototypes, sample batches and all other non-capital cost activities associated with the establishment and qualification of a production source; advanced manufacturing equipment; test and quality control facilities; data handling equipment.

5. Selection Criteria

5.1 Development Projects

The following considerations are taken into account when assessing a proposed project.

- (a) the extent of production sharing potential
- (b) the extent of real interest within the applicable associated government service(s)
- (c) the extent to which the associated government is prepared to monitor the project to ensure that the end product meets its development specifications
- (d) the extent to which the resources of DND, such as technical assistance, test facilities, G.F.E., etc., may be available
- (e) the extent of Canadian military interest
- (f) the extent to which existing Canadian industry is capable of accepting the responsibility for development
- (g) the extent of commercial implications
- (h) the extent to which Canadian industry is prepared to share financially
- (i) the extent of long range economic benefits to Canada in terms of technological advancement, financial advantages, continuity and suitability within the Canadian industrial engineering base.

5.2 Capital Equipment & Source Establishment Projects

The criteria outlined below are taken into account before recommending expenditures for either a capital assistance or source establishment project.

- (a) the extent of present and future foreign defence markets which the company can expect to capture as a result of the proposed assistance; as a secondary consideration, domestic defence markets
- (b) potential commercial use of equipment, end items or facility
- (c) the amount of Canadian content in the end items to be produced and, in the case of capital equipment, in the equipment itself
- (d) the extent of the recipient company's efforts to identify and exploit defence export markets, to establish suitable programs for retraining personnel, to review production planning, and, where applicable, to guarantee efficient employment of the capital equipment
- (e) relationship of the company's proposed investment to all other forms of Crown assistance received, past, present or proposed and success in exploiting such assistance
- (f) compatibility of the proposed new production facility with the company's existing competence, plans and finances; and the degree to which the new facility would fill a gap, and increase the efficiency of the plant
- (g) the ability of the company to finance its share of the costs
- (h) impact on the company's efficiency, production cost and profitability.

In addition to the above, the following criteria must also be taken into account for capital assistance projects:

- (j) versatility of the equipment for production of a range of items
- (k) the rate of obsolescence or economic life of the capital equipment; the degree to which the equipment is the most advanced for the intended purpose
- (l) the ability of proposed equipment to perform work which cannot now be done in Canada, or in recipient's facility, with a view to minimizing duplication of facilities in Canada.

6. Forms of Assistance

6.1 Development Projects

The Crown's assistance is provided in the form of a shared-cost contract. The particular sharing ratios of the total approved costs of the project can vary widely, depending upon various factors, including the number of participants in the project (e.g. costs could be contributed by the Crown, Company, and one or more allied Governments). Generally speaking, the Crown matches the Company's particular contribution. To date, on an overall basis, the Crown has contributed approximately 50% of the total costs of all development projects under this Program.

6.2 Capital Assistance Projects

Assistance in the form of a shared cost contract is provided to pay for the acquisition cost of approved equipment. The company's share (50%) is recovered by the sale of the equipment to the company over a five year period.

6.3 Source Establishment Projects

Assistance is provided, in the form of a shared cost contract, for specified costs of the project. Normally costs are shared equally.

7. Terms of Re-Payment

7.1 Capital Equipment Projects

The company re-pays its agreed share (i.e. 50%) of the total acquisition cost of approved equipment to the government over a five year period without interest.

7.2 Development Projects & Source Establishment Projects Repayment of Her Majesty's Contribution

- (a) In normal circumstances the employment of funds is limited to those companies which are prepared to make

an adequate contribution. In such cases, there is no recovery of the Government contribution except where the profit realized on the initially supported development and/or follow-on production orders is beyond that considered fair and reasonable. For the purpose of this assessment, an adequate contribution in support of the development contract equals or exceeds that of the Government.

- (b) In cases where the contractor is not able to make an adequate contribution (as defined above), a Government contribution is considered provided that any contract entered into with the company contains a condition that repayment will be made to the Government as follows: -
 - (i) 25% of all profits up to 10% and all profit in excess of 10% realized from the initially supported development contract and/or follow-on production until an equal contribution to the development project has been made by the company and the Government, and
- (c) If the development project to which the Government has contributed results in the contractor becoming the sole source of supply, in addition to the profit arrangements set forth in (a) and (b) above, it is expected that the follow-on production orders will enable the contractor and the Government to recover simultaneously their contributions in whole or in part on a pro-rata basis, i.e. in the form of a Royalty payment. Recovery of the Government contribution will be at a rate to be determined in consultation with the Financial Advisor.

Special Committee

- (d) As an alternative to refunding any amount to the Government, it may be arranged for the company to invest an equivalent amount on special projects, to be approved by the Department in advance, in the field of product development or source establishment.
- (e) To determine the repayment position, costs are computed in accordance with DDP-31 (Revised 11/57) in the case of military requirements and in accordance with generally accepted accounting principles in the case of commercial sales. To determine profit, the company contribution, but not the Government contribution, to development costs, will be considered an element of cost. Recovery of profits over 10% arising from contracts placed by DDP on behalf of any Canadian Government Department is not applied against recovery of the Government contribution to development projects. It may be acceptable for the contractor to arrange for a statement to be submitted to the Department, certified by a responsible officer of the company, substantiating the profit position. In addition, each contract contains the Department's usual discretionary audit clause, which permits audit by A.S.D. (Department of Finance). The company must agree to an examination of the cost and profit position of the company resulting from the initially supported development contract and any follow-on orders.

8. Title to Results & Property8.1 Source Establishment Projects

Not applicable. This situation does not arise.

8.2 Capital Equipment Projects

Title remains with the Crown until the company had paid its agreed share of the costs.

8.3 Development Sharing Projects

The disposition of design rights is a negotiable point and depends on the circumstances (e.g. sharing ratio, participation of a foreign country, etc.) of the individual proposal.

9. Program Administration9.1 Development Projects

If after a general, overall review of a proposal the Department's opinion is favorable, it is referred to the appropriate Technical Advisory Group. (These groups are staffed by DITC, DND, DDP. These are three separate groups, namely, Aerospace, Electronics and Weapons). The TAG is responsible for determining the technical suitability of the proposal and reports to the Inter-departmental Committee for Defence Development (IDC Committee). The IDC Committee membership is as follows: -

Assistant Deputy Minister (External Services), Department
of Industry, Trade and Commerce, Chairman

Assistant Deputy Minister (Logistics), Department of National
Defence
Deputy Chairman (Scientific) Defence Research Board

Assistant Deputy Minister (Operations) Department of Defence
Production
General Director, Office of Science and Technology, Department
of Industry, Trade and Commerce

Assistant Secretary, Treasury Board

General Director, Defence International Programs Branch,
Department of Industry, Trade and Commerce

This Committee makes a recommendation to Treasury Board.

9.2 Source Establishment & Capital Assistance Projects

If following the general, overall review the Department elects to further consider the proposal it is submitted to the Industry Modernisation for Defence Exports (IMDE) Committee for appraisal. The IMDE Committee membership is as follows:

Assistant Deputy Minister (External Services), Department
of Industry, Trade and Commerce, Chairman

Financial Adviser, Department of Industry, Trade and Commerce

Industrial Policy Adviser, Department of Industry, Trade and
Commerce

General Director, Defence International Programs Branch,
Department of Industry, Trade and Commerce

General Director, Machinery Branch, Department of Industry,
Trade and Commerce (Adviser)

This committee makes a recommendation to Treasury Board for approval in principle. The Department of Defence Production negotiate, prepare and administer specific contracts covering the approved proposal.

9.3 Follow-up of Approved Projects

Follow-up activity for capital assistance and source establishment projects is carried out by the Branch officer by making periodic visits to the company and by evaluating export sales received. For development projects a formal review group, the Project Review Group (consisting of members from DDP, DOI, and other Government agencies) is formed to monitor the project, recommend changes if necessary, and report regularly to the IDC Committee through the Technical Advisory Group.

10. Expenditures

10.1 The Department expenditures on the Program have been:

1960	\$ 5,449,685
1961	11,788,117
1962	10,462,673
1963	12,550,216
1964	27,785,229
1965	19,553,348
1966	26,919,014
1967	30,559,886
1968	32,280,670

11. Results and Achievements

11.1 Since the inception of the Program 165 projects have been supported and expenditures to date amount to \$148 million. Of the projects supported 117 costing \$99 million have been completed. Seventy-eight of these projects were commercially successful

and are achieving sales. The value of sales resulting from these projects is \$995 million. The total value of sales resulting from these projects is expected to reach \$2.4 billion during the sales life of the projects; the fraction of these sales in the civil sector of the export market is expected to rise to 50% from the present level of about one third.

Industrial Research Institute Program1.0 Program Objectives

1.1 The objectives of the program are:

- (a) to foster a closer relationship between universities and industry, thus assisting the universities to improve their understanding of the problems of industry, and helping industry to become acquainted with the latest pertinent scientific and technical developments;
- (b) to facilitate transfer of science and advanced technology to industry;
- (c) to provide scientific services for industrial firms unable to maintain research facilities and personnel of their own.

2.0 Program Authority

2.1 Treasury Board Minute No. 662697 dated December 12, 1966.

3.0 History

3.1 During 1966, a formal request was submitted to the Department by the University of Windsor, for a grant to assist in the establishment of an Industrial Research Institute to serve local industry. A preliminary proposal, received during the previous year, had been endorsed by the Windsor Chamber of Commerce.

3.2 In December of 1966, a recommendation to the Treasury Board resulted in the approval of a grant to the University of Windsor, as well as the approval to assist in the establishment of Institutes at Nova Scotia Technical College, McMaster University and the University of Waterloo. The Industrial Research Institutes formed at these four universities began the acquisition of staff, and made preliminary contacts with industry during 1967.

3.3 By January 1969, all of the institutes had completed some research contracts, and were actively conducting research with respect to others.

4.0 Eligibility Criteria

4.1 To qualify for assistance under the Program, Industrial Research Institutes must be wholly owned by a Canadian university and must utilize the facilities of the university to conduct contract research on behalf of industry.

5.0 Forms of Assistance

5.1 Under the Industrial Research Institute Program, assistance takes the form of a grant, payable in instalments, usually over the 3 year period following

Appendix P

5.1 (continued)

the establishment of the Institute. The payments made in any one year are based on actual expenditures made by the university during the year for the following purposes:

- (a) Salaries and wages, including fringe benefits, of the manager, and assistant manager (if any) of the Institute and of the secretarial and clerical staff of the Institute.
- (b) Travel expenses incurred by the manager and assistant manager of the Institute.
- (c) Rental of offices and office equipment, and the cost of office supplies, printing, telephone and telegraph services for the Institute.
- (d) Other administrative expenses as may be approved by the Department.

6.0 Administration

6.1 Each Institute is managed by a full-time manager (or director), usually with an assistant, and a small secretarial and clerical staff. Each Institute operates with the guidance of an advisory board, or a board of directors. A representative of the Office of Science and Technology sits upon the board of each of the four institutes.

7.0 Expenditures

7.1 During the fiscal year 1967-68, expenditures made by the Department totalled \$84,206, of which \$40,000 was applied to the Atlantic Industrial Research Institute of Nova Scotia Technical College. The remainder, \$44,206 was directed towards the three Ontario institutions.

7.2 During fiscal 1968-69, it is expected that expenditures will total approximately \$168,000, of which the Atlantic Industrial Research Institute will receive \$40,000. The remaining \$128,000 will be applied to the operation of the three institutes in Ontario.

8.0 Results and Achievements

8.1 All of the four institutes organized to date have acquired staff and have established widening contacts with industry. A number of research contracts have been completed by each, and each institute is engaged in ongoing research for industrial sponsors.

8.2 Although the size of contracts to date have been generally small, the response has been encouraging, and the volume appears to be growing at a

8.2 (continued)

satisfactory rate. Supplementary educational programs have been arranged for industry by some of the Institutes, and these have been well received. These supplementary programs have taken the form of specialist training and technical seminars.

8.3 A number of other universities, contemplating the establishment of Industrial Research Institutes have been in contact with the Department. Several appear to be well advanced in their planning, and formal applications are expected early in fiscal 1969-70.

Appendix Q

Program for Increasing Productivity and Efficiency
in the Manufacture and Use of Building Equipment
Accessories and Materials (BEAM)

1. Program Objectives

1.1 The overall objectives of the BEAM Program are to increase productivity and efficiency in the manufacture and use of building equipment, accessories, and materials.

1.2 After a study of the industry in Canada, the United States and abroad and after numerous discussions with representatives of the industry, its associations, and institutes, it was determined and agreed that increases in productivity and efficiency could be best achieved by meeting the following specific objectives:

- (a) The establishment of a comprehensive construction information system.
- (b) The adoption of modular coordination.
- (c) The greater industrialisation of the building process.
- (d) The adoption of more uniform building regulations throughout Canada and the establishment of a means of assessing and approving new materials and techniques.
- (e) The establishment of an awards program to foster improved design in new materials, methods, and techniques.

2. Program Authority

2.1 The BEAM Program was accepted for funding by Ministerial approval. The various projects were accepted for funding either on the approval of the Minister and Treasury Board or on the approval of the Deputy Minister and Treasury Board.

3. Expenditures

1966-67	\$ 18,500
1967-68	\$160,000
1968-69 (10 mo)	\$100,000

4. Results and Achievements

4.1 A prototype comprehensive construction information system for the collection, storage, retrieval and dissemination of information pertinent to building equipment accessories and materials is to be established in 1969.

4.2 The concept of modular coordination in construction in the dimensioning of products and the design of buildings has been accepted as standard practice by the Canadian government and has received support by several provincial departments of Public Works and various sectors of the Canadian construction industry.

4.3 Increased industrialization of building processes has taken place by utilizing new techniques, new materials, and new methods, and by adapting existing ones to changing conditions.

4.4 The economic benefits that result from the adoption of uniform building regulations such as the National Building Code have been generally realized by provinces and communities.

4.5 A more creative use of materials in the design and assembly of structures and construction products has been encouraged through design awards programs.

Appendix EList of Typical Publications and Reports1. Publications

Orr, J.L., "A Technological Strategy for Industrial Development", Science Forum, Vol. 1, No. 4, 1968.

Orr, J.L., "Government's Role in Stimulating the Innovation Process", Industrial Canada, 1966.

Orr, J.L., "Incentives for Industrial Research and Development in Canada", The Tax Executive, 1966.

2. Reports1964

Analysis of Scientific Research and Development Activity in Canadian Industry.

A Projected National Scientific Budget for the Expansion of Industrial Research and Development.

Scientific Manpower for Industrial Research and Development.

A Critique on Techniques of Direct Financial Assistance for Promoting Industrial Research and Development.

1965

Economic Aspects of the Proposed NAE 30-Foot Low Speed Wind Tunnel.

Glass and Glass Products in Canada.

Commercial Metal Heat Treating Facilities in Canada.

Report on the Canadian Technical Wood Products Mission to the Western United States.

A Study of the Particleboard Industry as a Result of a Technical Study Tour of the European Particleboard Industry.

1966

Current Status of the International System of Measurement in Canadian Manufacturing Industry.

Ten Systems of Prefabricated Masonry.

Report of the Canadian Technical Mission on the Use of Prefabricated Structural Ceramics in Industrialised Building in Europe.

The Current Status and Future Trends in the Powder Metallurgy Industry.

Die Casting in Canada.

Report on the Canadian Hardwood-Plywood Mission to Europe.

Aerospace Study. Vol 1 - The World Market for Aerospace Products.

1967

Statistical Data on Industrial Research and Development in Canada.

Report on the Canadian Technical Mission on the Use of Prefabricated Steel Components in Industrialized Building in Europe.

BEAM Bulletin.

Report of the Canadian Powder Metallurgy Technical Mission to European Countries.

Advanced in the Manufacture of Powder Metallurgy Parts and Components.

Die Casting in Canada.

R&D Needs of the Canadian Furniture Industry (Woods, Gordon & Co.)

Aerospace Study: - Canadian Aerospace Capabilities and Resources.

1968

Lectures and Proceedings on Six Regional Conferences on Modular Coordination.

Lectures and Proceedings of a National Conference on a Systems Approach to Building.

Beam Bulletin.

The Future of Powder Metallurgy Industry in Canada.

Report on the Major Appliance Industry.

Report on the Tour of the Scandinavian Chemical Pulp Industry.

1969

Report on Optimum Household Furniture Manufacturing Facilities.

Appendix SConferences and Seminars Sponsored by the
Department of Industry, Trade and Commerce

The following is a partial listing of conferences and seminars, organized by the Department, to disseminate information and to stimulate industrial discussion and interest.

1966

- (1) Wood Products Seminar - Kelowna and Vancouver, B.C.
- (2) Industrial Wood Products Seminar: The Future of Poplar Utilization in
Alberta - Edmonton, Alberta
- (3) Structural Steel Seminars - Montreal, Quebec; Calgary, Alberta and Toronto, Ontario
- (4) Seminar on Automatic Process Control - McGill University
- (5) Seminar on Technological Forecasting - Department of Industry, Ottawa.

1967

- (6) International Symposium on Air Cushion Vehicles; to familiarize Canadian industry
and potential users with international development on ACV's - Toronto
- (7) Technical Seminar for the Canadian Wood Pallet and Container Association - Ottawa
- (8) Regional Conferences on Modular Coordination - Halifax, N.S.; Montreal, Quebec;
Toronto, Ontario; Winnipeg, Manitoba; Edmonton, Alberta; Vancouver, B.C.
- (9) Seminar on Automatic Process Control - Universities of Laval, British Columbia,
Alberta and Manitoba.

1968

- (10) Foundry Management Improvement Seminars - Toronto
- (11) National Conference on a Systems Approach to Building
- (12) Seminars on Automatic Process Control - Universities of Toronto and Waterloo

TABLE 1

Major Projects Funded or Performed by the Department1. PAIT Projects

The following companies had entered into PAIT assistance agreements up to Dec 31st, 1968.

Abitibi Paper Co. Ltd.,	Toronto, Ontario.
Acme Paper Products Co. Ltd.,	Toronto, Ontario
Algocen Mines Limited,	Sault Ste. Marie, Ontario.
Alexbow Limited,	Ottawa 7, Ontario
Algoma Central Railway	Sault Ste. Marie, Ontario.
Art Laboratory Furniture Ltd.,	Montreal 8, Quebec.
ATCO Industries Ltd.,	Calgary, Alberta.
Atlantic Forest Products Ltd.,	Fredericton, N.B.
Atlas Chain Co. Ltd.,	Victoria, B.C.
Atlas Hoist & Body Incorporated	Montreal 9, Que.
Atlas Steels Limited,	Welland, Ontario.
Automatec Inc.,	Montreal, Que.
Aviation Electric Limited,	Montreal 9, Quebec.
Baker Talc Limited,	Montreal 3, Que.
Baldrive Company,	Galt, Ontario.
Balloon Transport Limited,	Vancouver 9, B.C.
Barringer Research Limited,	Rexdale, Ontario.
Bata Shoe Company of Canada Ltd., (8)	Batawa, Ontario.
Ben's Limited,	Halifax, N.S.
Brantford Cordage Co., The,	Brantford, Ontario.
Brockville Chemical Ind. Ltd.,	Maitland, Ontario.
Brunswick of Canada Limited,	Cooksville, Ontario.
C.A.E. Industries Ltd., (2)	Montreal, Que.
Canada Iron Foundries Ltd.,	Montreal 2, Que.
Canada Malting Co. Ltd.,	Toronto, Ontario.
Canada Wire & Cable Co. Ltd.,	Toronto 17, Ontario.
Canadair Ltd.,	Montreal, Que.
Canadian Cane Equipment Ltd., (2)	Montreal, Que.
Canadian Car,	Fort William, Ontario.
Canadian Forest Products Limited,	Vancouver 1, B.C.
Canadian General Electric, (2)	Peterborough, Ontario.
Canadian Industries Limited,	Montreal, Que.
Canadian Lady Corset Brand Co. Ltd.,	Montreal, Que.

Canadian Stackpole Limited,	Toronto 14, Ontario.
Canadian Structural Clay Association,	Willowdale, Ontario.
Canadian Technical Tape,	Montreal 9, Que.
Canadian Westinghouse Co. Ltd., (2)	Hamilton, Ontario.
Carbitron Development Ltd.,	Vancouver 6, B.C.
Carey-Canadian Mines Limited, (2)	East Broughton Stn., Quebec.
Champlain Power Products Ltd.,	Toronto 18, Ontario.
Chemech Engineering Limited, (2)	Vancouver 9, B.C.
Col Flo Process Limited,	Toronto 18, Ontario.
Collis Leather Co. Ltd.,	Aurora, Ontario.
Column Flotation Co. of Canada Ltd.,	Dollard Des Ormeaux, Quebec.
Cominco	Montreal 2, Que.
Computing Devices of Canada Ltd.,	Ottawa, Ontario.
Corod Manufacturing Co.,	Edmonton, Alta.
De Havilland Aircraft of Canada Ltd.,	Toronto, Ontario.
Delmar Chemicals Limited, (2)	Montreal 3, Que.
Dickinson's Limited,	Burnaby 2, B.C.
Dominion Engineering Works Ltd., (2)	Montreal, Que.
D. & S. Engineering Ltd., (2)	Montreal 11, Que.
Dunlop of Canada Ltd.,	Toronto 8, Ontario.
Dynacast Limited,	Lachine, Que.
Elastine Process & Development Ltd.,	Toronto 1, Ontario.
Eldorado Mining & Refining Ltd., (2)	Ottawa, Ontario.
Electro Dynamics & Telecom Ltd.,	Chatham, Ontario.
Electrovert Manufacturing Corp. Ltd.,	Montreal, Que.
Federal Pacific Electric,	Toronto 16, Ontario.
Ferranti-Packard Electric, (5)	Toronto 16, Ontario.
Ferrodyn Corporation Limited,	Montreal 3, Que.
Field Aviation,	Malton, Ontario.
Fischer & Porter (Canada) Ltd.,	Downsview, Ontario.
Fisher Gauge Works Limited,	Peterborough, Ontario.
Fortune Footwear Limited,	Burlington, Ontario.
Found Brothers Aviation Limited,	Rexdale, Ontario.
Fritz Werner Limited,	Montreal 9, Que.
G & B Industrial Project Consultants Ltd.,	Downsview, Ontario.
General Concrete Geomet Reactors Limited,	Gloucester P.O., Ontario.
Glolok Co. Ltd.,	Montreal 38, Que.

Glulam Products Limited, (2)	New Westminster, B.C.
Guildline Instruments Limited, (2)	Smith Falls, Ontario.
Hamilton Hastings Co. Ltd.,	Downsview, Ontario
H. J. Heinz Co. of Canada Ltd.,	Leamington, Ontario.
Hobrough Limited,	Ottawa 4, Ontario
Hughes Trim Limited,	Montreal
Huntec Limited, (2)	Toronto 16, Ontario
Hydro Space Development,	Thornhill, Ontario
Interprovincial Steel & Pipe Corp. Ltd.,	Regina, Sask.
J. D. Irving Limited,	St. John, N.B.
Kameco Limited,	Montreal 12, Que.
Lacasse Machinery Inc.,	Levis, Que.
Lamb-Cargate Industries Limited,	New Westminster, B.C.
Laurentian Concentrates Ltd.,	Ottawa 6, Ontario.
Leigh Instruments Limited,	Carleton Place, Ontario
Maple Leaf Mills Ltd.,	Toronto, Ontario.
Maranda & Labrecque Ltee.,	Quebec City, Que.
Marb-O-Matic Corporation Limited,	Toronto 3, Ontario.
Maritime Industries Ltd.,	Vancouver 10, B.C.
Maritime Television Ltd.,	Stellarton, N.S.
Medico Rearings Limited,	Ville de Laval, Que.
Mimik Limited,	Galt, Ontario.
Montreal Locomotive Works Limited,	Montreal, Que.
MacMillan Bloedel Limited,	New Westminster, B.C.
McPhar Geo. (2)	Don Mills, Ontario.
National Sea Products Limited,	Halifax, N.S.
Noma Lites Canada Limited,	Scarborough, Ontario.
Noranda Mines,	Toronto, Ontario.
Nordic Biochemicals Ltd.,	Montreal 12, Que.
Preci-Tools Limited,	Montreal, Que.
Pylon Electronic Development Co. Ltd., (2)	LaSalle, Que.
Pyramid Machine Works Ltd.,	North Vancouver, B.C.
Radal Ltd.,	Montreal, Que.
Rader Pneumatics	Montreal, Que.
R.C.A. Victor Co. Ltd.,	Montreal, Que.
Riley's Reproductions Ltd.,	Calgary, Alberta.
Robson-Lang Leathers,	Oshawa, Ontario.

Rolland Paper Co. Ltd.,	Montreal, Que.
Shanfield Industries Ltd.,	Toronto, Ontario.
SIOC Limited	Toronto, Ontario.
Slater Steel Industries Ltd.,	Hamilton, Ontario.
Solids Pipeline Research & Development Assoc.,	Calgary, Alberta.
Solids Pipeline - Economic Study Assoc.,	Calgary, Alberta.
Steep Rock Iron Mines Limited,	Steep Rock Lake, Ontario.
Stein-Hall Limited,	Westhill, Ontario.
Stone & Webster Canada Limited,	Toronto, Ontario.
Sun-Rype Products Ltd.,	Kelowna, B.C.
Susan Shoe Co.,	Burlington, Ontario.
Timberjack Machines Ltd., (2)	Woodstock, Ontario.
Unitron Industries Limited,	Kitchener, Ont.
Valeriotte Electronics Ltd.,	Guelph, Ontario.
V-Mark Automation Ltd.,	Montreal 15, Que.

N.B. -- Number in parentheses after company name indicates the number of projects.

2. DIP Projects

The following companies have been granted DIP assistance

1964

Atlantic Films & Development	St. John's, Newfoundland
Avian Aircraft Limited	Georgetown, Ontario
Canadair Ltd.	Montreal, Quebec
Canadian Marconi	Montreal 16, Quebec
Central Dynamics	Pointe Clair, Quebec
Collins Radio Company of Canada Limited	Downsview, Ontario
EMI Cossor Electronics Ltd.	Dartmouth, Nova Scotia
Frigistor	Montreal, Quebec
Garrett Manufacturing Limited	Rexdale, Ontario
Geo-Met Reactors Ltd.	Ottawa, Ontario
Inter Tel Consultants	
Leigh Instruments	Carleton Place, Ontario
McGill University	Montreal, Quebec
Northern Electric Co. Ltd.	Montreal, Quebec
Orenda Limited	Malton, Ontario
TAMCO Limited	LaSalle, Quebec
United Aircraft of Canada Limited	Longueuil, Quebec
Varian Associates of Canada Ltd	Georgetown, Ontario
York Gears Limited	Toronto 19, Ontario

1965

Aviation Electric Limited	Montreal, Quebec
CAE Industries Ltd.	Montreal, Quebec
Canadian Car	Fort William, Ontario
Canadian Marconi	Montreal 16, Ontario
Computing Devices of Canada Ltd. (2)	Ottawa 4, Ontario
de Havilland Aircraft of Canada Limited	Downsview, Ontario
EMI Cossor Electronics Ltd.	Dartmouth, Nova Scotia
General Precision Industries Ltd.	Montreal, Quebec
Go-Tract Ltd.	Ste. Anne de Bellevue, Quebec

McGill University	Montreal, Quebec
Ontario Research Foundation	
Orenda Limited	Malton, Ontario
RCA Victor Limited	Montreal, Quebec
REP	
Timmins	
United Aircraft of Canada Limited	Longueuil, Quebec
Westinghouse	Montreal, Quebec
<u>1966</u>	
ATCO Industries Ltd.	Calgary, Alberta
Barringer Research Ltd.	Rexdale, Ontario
Bowmar Canada Ltd.	Ottawa, Ontario
Bristol Aerospace	Montreal, Quebec
CAE Industries Ltd.	Montreal, Quebec
Canadair Ltd.	Montreal, Quebec
Collins Radio Company of Canada Limited	Downsview, Ontario
Computing Devices of Canada Ltd.	Ottawa 4, Ontario
de Havilland Aircraft of Canada Limited	Downsview, Ontario
Edo (Canada) Limited	Vancouver, B.C.
EMI Cossor Electronics Ltd.	Dartmouth, Nova Scotia
Ferranti-Packard Electric Limited	Toronto 15, Ontario
FMC - Beloit - Sorel	
Garrett Manufacturing Limited	Rexdale, Ontario
Gulton Industries (Canada) Limited	Gananoque, Ontario
Hawker Siddley Canada Ltd.	Malton, Ontario
Irvin Air Chute Ltd.	Fort Erie, Ontario
Leigh Instruments Limited	Carleton Place, Ontario
Leitz, Ernst, (Canada) Limited	Midland, Ontario
Litton Systems (Canada) Limited	Rexdale, Ontario

McGill University	Montreal, Quebec
Northern Electric Co. Ltd.	Montreal, Quebec
Okanagan Helicopters	
Precision Electronic Components Ltd.	Toronto 15, Ontario
United Aircraft of Canada Limited	Longueuil, Quebec
Westinghouse	Montreal, Quebec
<u>1967</u>	
ATCO/ORF	
Avian Aircraft Limited	Georgetown, Ontario
Aviation Electric Limited	Montreal, Quebec
Bristol Aerospace	Montreal, Quebec
CAE Industries Ltd.	Montreal, Quebec
Canadair Ltd.	Montreal, Quebec
Canadian Marconi	Montreal, Quebec
Computing Devices of Canada Limited	Ottawa 4, Ontario
de Havilland Aircraft of Canada Limited	Downsview, Ontario
Garrett Manufacturing Limited	Rexdale, Ontario
Genaire Ltd.	St. Catharines, Ontario
Orenda Limited	Malton, Ontario
REP	
Timmins	
Velan Engineerings Companies	Montreal 9, Quebec
<u>1968</u>	
ATCO Industries Ltd.	Calgary, Alberta
Aviation Electric Limited	Montreal, Quebec
Canadair Ltd.	Montreal, Quebec
Canadian Marconi	Montreal, Quebec
Computing Devices of Canada Ltd.	Ottawa 4, Ontario
de Havilland Aircraft of Canada Limited (2)	Downsview, Ontario
Fleet Aircraft	
Garrett, John E., (Limited)	New Glasgow, Nova Scotia

General Precision Industries Ltd.	Montreal, Quebec
Irvin Air Chute Ltd.	Fort Erie, Ontario
Leigh Instruments	Carleton, Place, Ontario
Lucas Rotax	
Northern Electric Co. Ltd.	Montreal, Quebec
Norton (Canada)	
United Aircraft of Canada Limited	Longueuil, Quebec
Velan Engineering Companies	Montreal 9, Quebec

Appendix T2. Studies by the Office of Economics3.1 Economic Research Studies3.1.1 Investment Analysis

Continuing efforts are made to improve and better evaluate forecasts of capital spending through the study of biases in survey response, the relation of capital spending to such factors as capacity utilization and supply of funds and other such projects.

3.1.2 Market Analysis

3.1.2.1 International Market Commodity Studies - This project consisted of a number of detailed studies regarding international markets for selected resource-type commodities focussing attention on the European Continent. Specific commodity studies followed a detailed analysis of socio-economic developments in Western Europe. This provided the background for judgments regarding probable patterns of economic growth - necessary for deriving forecasts of consumption and trade in commodities. A detailed examination was then undertaken of national and international statistical sources in order to prepare a comprehensive set of comparative statistics on production consumption and trade for the selected commodities. Statistical techniques were then devised to relate demand and supply trends to future prospects and overall evaluations prepared of Europe's changing role in certain world commodity markets - along with the probable role in prospect for Canada as a world supplier.

3.1.2.2 Foreign Imports and Canadian Trade - This research project was devised in order to examine Canada's position as a supplier relative to other supplier countries in world markets. To this end an extensive review was undertaken of the changing import trade structure of some fifty countries or areas to whom Canada exported about \$10 million in 1966. The project required thorough familiarity with the sources and applicability of international trade statistics and classification systems. It also involved the accumulation of detailed knowledge concerning the structure

and development of various foreign economies, so as to ensure the proper presentation of import profiles and meaningful comparative data. The completed project provides a useful descriptive and analytical framework for a broad assessment of Canada's position in foreign markets for selected commodity groups.

3.1.2.3 The Market Share Project - The "market share" project is designed to formulate a meaningful presentation of participation in the world market by country and by commodity group. The basic program was drawn up to cover 35 countries and 20 commodity groups over a 15-year time span, modified to meet individual study requirements. In general three types of matrices - total imports, inter-country exports and total exports - comprise the computer input. Hypothetical assumptions that a given country maintains its base year share of world trade in commodity groups, sub-groups and country markets are tested against actual performance. The results indicate the manner in which total export growth is influenced by commodity and country trade dynamics and the ability or inability of a country to maintain or increase its share of a broad array of commodities entering world trade. This project is now in the development stage with an initial pilot study completed.

3.1.3 Productivity

3.1.3.1 Interfirm Comparisons - Plant productivity and cost effectiveness studies to reveal the causes and factors of variations and changes in industrial efficiency. This program is designed to yield information on such vital matters as specialization, product variety, standardization, capital intensity by type, capacity utilization, technical and economic life of fixed capital, etc.

3.1.3.2 Impact of plant size and capital intensity on production - These studies are based on statistical information generated from special DBS computer tabulations and are

designed to answer such policy questions as "Which industries need more capital in order to be more competitive" and "What is the impact of scale on efficiency," "Which are the industries where more concentration is necessary" and "What is the optimum scale of operation in specific industries".

3.1.3.3 Relationship between Productivity, Wages, and Prices -

This consisted of an analyses of cross-sectional and temporal statistical series to indicate the behaviour of these relationships across the various industries and regions of the country. It has been used by the government in developing its productivity and incomes policies.

3.1.3.4 Resources Utilization and International Cost

Competitiveness of the Canadian Chemical Industry - These studies are to be released shortly as part of a major departmental study on the Chemical Industry. They identify the major cost and economic factors which determine the competitive position of the chemical industry and evaluate the utilization of resources by the Canadian industry. This information is intended to facilitate sound planning and decision-making by government and the Canadian chemical industry.

3.1.3.5 Comparative Analyses of the Performance of Canadian

and United States Manufacturing Industries - This project serves to throw light on various factors and determinants of the competitiveness of Canadian industries in comparison with the behaviour of similar elements in United States economy. It deals with such matters as variations in industrial organization, cost structure, wages, process, profitability, labour-capital trade-offs in the production functions of various industries, impact of specialization, etc.

3.2 Economic Data Collection

3.2.1 Investment Analysis

3.2.1.1 Capital Expenditure Data - In September and October of each year the Branch personnel collect information by field interviews from about 200 of the largest companies and other spending agencies in Canada on plans for capital spending

in the one to two year period immediately ahead. In addition to quantitative data information is collected on the factors that affect the decision making of companies in regard to capital spending.

3.2.1.2 Data on Foreign Subsidiaries in Canada - The Branch collects by questionnaire forms on an annual and quarterly basis certain information from the larger foreign-owned companies in Canada which is not available from other sources. The data includes current and capital transactions with foreign affiliates and with others on a geographic basis.

3.2.1.3 Data on International Capital Flows - The Branch collects in considerable detail, on a quarterly basis, by questionnaire, information on the foreign asset and liability position of companies incorporated in Canada. In addition periodic surveys are made of foreign capital transfers made or planned by the same companies. This data is collected as part of a program to monitor overseas investment by Canadian companies as required pursuant to an arrangement with the United States exempting Canada from United States regulations affecting capital flows.

3.2.1.4 Information on Corporate Behaviour of Subsidiaries - Qualitative information has been collected from some thousands of subsidiaries in Canada, by correspondence, on attitudes towards and conformity with certain principles of good corporate behaviour.

4. Industrial Sector and Technological Studies

4.1 Aerospace Study - To assist the sound economic and technological growth of the Canadian aerospace industry the Department has undertaken a three phase study. The study deals with the world market for aerospace products, the resources and capabilities of Canada's aerospace community, and the long term prospects for rationalisation and growth of aerospace activity in Canada.

4.2 Aerospace Propulsion Study - The objective of the study is to assess the needs of industry in the mid-70's in terms of R&D, production and sub-contracting capabilities, required to maintain a growth rate comparable to similar competitive industries or at least equivalent to the expected growth rate in GNP.

4.3 Advanced Materials Study - The objective of the study is to assess the effect of new material advances on the Canadian aerospace industry, and their implications for other industry sectors.

4.4 Aerospace Special Products - The primary purpose of this project is to conduct a series of studies and analyses to identify, fruitful technological areas, and to establish long-range plans for the support of industry in terms of marketing, R&D, production and resources.

4.5 Space Industry Project - The objectives are to identify the actual and potential technical, economic and management problem areas of the space industrial sector and to identify the industrial development opportunities that will be created by the establishment of a co-ordinated national space program under a central agency.

4.6 Computerised Simulator Study - This study which involves developing a computerised economic model of the Canadian ship building industry, is being initiated to establish if this method of analysing the complex socio economic problems of a total industrial sector is practical.

4.7 Education Requirements of Ship Building Industry - Phase I of this study has entailed an examination of the status of professional education levels in the Canadian ship building industry and will make recommendations on the need to establish university level education in naval architecture or marine engineering. Phase II of the study will give in detail a plan of integration and a means of selecting the university most suited to the defined needs. It will examine the the case for integration with an industrial research centre.

4.8 Air Cushion Vehicles- The objectives of the Department are to analyse the implications of emerging air cushion technology, to promote research and development in this field, and to encourage the dissemination of new research and development progress.

4.9 Oceanology and Marine Equipment - The Department is assisting the Marine Industry in establishing those formal organisations and institutions required to enable it to undertake more effectively an expanded role in this developing technology of "oceanology".

4.10 Food Science Scholarship Program - The Department has made a study of the employment of Food Scientists in the Food Industry.

Concurrent with that study, a consultant investigated the university programs in Canada related to Food Science. These studies carried out in conjunction with the Canadian Institute of Food Technology, (CIFT), determined that a requirement existed for Food Scientists and several universities had or anticipated programs to develop people with this specialty. It was noted that a dearth of scholarships existed to attract students. The Branch, in cooperation with CIFT and the Food Industry had developed a scholarship program which will offer about 14 \$1,000 scholarships for the academic year 1969-70 at a cost of \$5,000 to the Department.

- 4.11 Fruit & Vegetable Study/Bakery Study - The purpose of each study has been to investigate each sector's structure, performance and to determine the nature of the production function. In the course of these studies the Branch has evaluated the competitiveness of each sector through examination of the cost structure. These studies also have looked at the pricing policies practised, and have investigated the barriers to entry. Several other factors have been included in this work - these are the degree of oligopoly and a measure of the effective tariff rate, a measure of productivity and technological forecasting.
- 4.12 Computer Simulation of a Manufacturing Facility - The project objective is to develop a computer aided simulation of industrial development based on a method for projecting the economic future of an industrial manufacturing plant.
- 4.13 Canadian Major Appliance Industry Study - The purpose of the study and analysis is to determine if and how the performance of the Canadian Major Appliance Industry can be improved.
- 4.14 Fuel Cell Power Sources - A technico-economic study of the market potential and economic advantages supporting an R&D, production and marketing program.
- 4.15 High Voltage and High Power Research - The collection of data, and analysis of need for new research facilities.
- 4.16 Medical Electronics - A study to assess the potential of medical electronics as a growth area in electronics by means of studying the world market; the capabilities and activities of Canadian industry;

the extent and nature of research and development in Government laboratories and institutions.

4.17 Process Automation - A study to determine to what extent the pulp and paper mineral processing industries are applying advanced automation techniques.

4.18 R&D Incentives in Relation to the Chemical Industry - A study of the effect of R&D incentives on the R&D effects of the chemical industry.

4.19 Standards Activities - A study was carried out which led to the proposal to set up a National Standards Organisation.

4.20 Information for Industry - A study of the information problem facing Canada to-day was initiated by the Department. This study is fully discussed in Appendix U.

4.21 Canadian Satellite Communications System - The Department made a study of Canadian industrial capability in satellite communications technology. It is more fully discussed in Appendix U.

1. Study on Technical Information for Industry

- 1.1 The Canadian economy must develop at a rate which will provide employment opportunities for our expanding population and concurrently improve our standard of living relative to other industrialized countries. In order to accomplish this, industry must be encouraged to use new technology and innovations. The optimum use must be made of knowledge generated in all parts of the world to enable us to develop and produce new or improved products, processes and services. Existing means for making world-wide information available to Canadian managers, engineers, technologists and technicians in business, industry and commerce are inadequate and do not sufficiently reflect the advances that have taken place in communications and information handling technology during the past quarter of a century. As a consequence, the need and the opportunity exist for Canada to design and build a more suitable and advanced system for processing and disseminating knowledge acquired from all parts of the world, with the objective of incorporating this wealth of ideas, experience and know-how into the everyday activities of the nation. By so doing, we would have access to most of the results of the vast amount of research and development work performed around the world for the trivial cost of the information system.
- 1.2 A broad study embracing many facets of the information problem facing Canada today was initiated by Department of Industry in 1967 and undertaken in collaboration with, and under the general sponsorship of, the Science Secretariat (and, latterly, the Science Council). The DOI Industrial Research Adviser's Office contributed leadership, personnel, funds and office services in large measure to this study because it is believed that the timely comprehension and adoption by Canadian industry of new developments, wherever they may originate, are vital to the continued growth of Canadian industry and its international competitiveness and the creation of an environment in which innovation and entrepreneurial initiative can flourish.
- 1.3 The Study of Scientific and Technical Information in Canada was formally established on March 20, 1967, under the auspices of the Science Secretariat. The members of the Study Group were drawn from government, industry and universities, and were assigned responsibilities for examining the availability, demand for and use of scientific and technical information in these three sectors of the economy, and for appraising developments in information handling technology, assessing the

1.3 (continued)

economic implications of the use of scientific and technical information, reviewing the involvement of foreign countries and international organizations with scientific and technical information, and examining the supply and demand of trained information personnel.

1.4 Consultations with concerned Canadians were both written and verbal.

Advertisements were placed in the leading newspapers across Canada inviting briefs. Background information was sent to 80 English-language and 33 French-language technical journals, primarily directed at the individual scientist or engineer. A set of guidelines to assist in the preparation of briefs was distributed to over 500 agencies, including trade associations and technical societies, manufacturing establishments, educational and research institutions, and individuals. As a result 233 written briefs were received. Special surveys were conducted with the Canadian Research Management Association, the Agricultural Institute of Canada, and the Canadian Library Association.

1.5 In addition, approximately 2,500 individuals associated with industry, universities and government answered questionnaires to enable the Study Group to make some estimate of individual costs using present methods. Over 1,000 published documents were collected and evaluated, and the Information Systems Analysis Centre of the Department of Industry, containing extracts of another 1,000 items, was utilized.

1.6 Members of the Study Group held open meetings with industrial, university library and provincial government representatives across Canada, followed by private briefings as required. Visits were made to Victoria, Vancouver, Edmonton, Calgary, Regina, Saskatoon, Winnipeg, Toronto, London, Waterloo, Kingston, Montreal, Quebec, Sherbrooke, Halifax, Fredericton, Moncton, Charlottetown and St. John's.

1.7 Study Group members also contacted major international organizations, in many cases actively participating in meetings and seminar as well as visiting foreign institutions working on the STI problem. The Study Group was given verbal briefings by many visiting international experts, including the following:

Eugene Garfield	Director, Institute for Scientific Information Philadelphia, Pa.
P. J. Judge	Directorate for Scientific Affairs, Organization for Economic Co-operation and Development, Paris
R. A. Kennedy	Information Retrieval Director, Bell Telephone Laboratories, Murray Hill, N.J.

Appendix U

1.7 (continued)

Alexander King	Director for Scientific Affairs, Organization for Economic Co-operation and Development, Paris
W. T. Knox	Former Chairman, COSATI. Presently Vice-President McGraw-Hill Inc., New York, N.Y.
B. M. Fry	Former Director, Clearinghouse for Federal Scientific and Technical Information. Presently Dean, Graduate Library School, Indiana University, Bloomington, Ind.
D. H. May	Office for Scientific and Technical Information Department of Education and Science, London, England.
R. C. Sheldon	Massachusetts Institute of Technology, Cambridge, Mass.
C. W. Sherwin	Former Assistant Secretary of the Department of Commerce, Washington, D.C.
J. R. Smith	Director of INSPEC, Institution of Electrical Engineers, London, England.
Yuri Sorokin	Director, All-Union Institute of Scientific and Technical Information (VINITI), Moscow, U.S.S.R.

- 1.8 The report containing the observations, conclusions and recommendations of the study is in the process of being published by the Science Council and should be available during April 1969.

2. Canadian Satellite Communications System

- 2.1 In July 1967, the Department of Industry was requested by the Task Force on Satellites of the Science Secretariat to undertake a study in support of a Satellite Communication System.
- 2.2 Specifically, the Department was asked to determine Canadian industrial capability in satellite communications technology and the extent to which Canadian industry could design, develop and manufacture a complete satellite communication system. To achieve this, it was necessary to specify the system and estimate costs and schedule.
- 2.3 The study was carried out by a small group of departmental officers under the Industrial Research Adviser with the assistance of personnel from government departments, notably the Department of Transport. The group visited four U.S. companies engaged in space technology and received a great deal of assistance. From these visits and on the basis of reports from earlier studies carried out for the Department of Transport, the group was able to define the required system and make the necessary estimates of cost and schedule.
- 2.4 Subsequently the group visited ten Canadian companies to obtain the necessary information which led to the assessment of Canadian industrial capability and interest.
- 2.5 The details of the study and the conclusions reached were set down in the report "Canadian Industrial Capability for the Development of Domestic Satellite Communication Systems" which subsequently became an appendix to the Report of the Task Force on Satellites to Cabinet.
- 2.6 Amongst other things, this study provides a substantive basis for maximizing Canadian content of any communication satellite which may be procured by Canada.

3. DIP Case History - United Aircraft Limited - PT6 Engine

- 3.1 United Aircraft Ltd. (UACL) has been engaged in original design and development since 1957. Engineering activity has included responsibility for the concept and preliminary design of the JT12 (J60) turbojet engine; design, construction and qualification of the accessory gearbox used on the Tyne engine installed in the Canadair CL-44 aircraft, and design, development and manufacture of the PT6 turboprop/turboshaft engine and its derivatives.
- 3.2 Since the first jointly-funded development contract was signed in March of 1960, UACL's PT6 development has been a most successful venture; for example, engines delivered up to December 1968 totalled 2,689 representing sales of approximately \$90M(80% export). The engineering team has expanded from a nucleus in 1957 to some 500 in 1967.
- 3.3 Versions of the PT-6 are flying in many types of aircraft. The shaft-turbine version powers several helicopters. The engine has also been developed in several marine and industrial engine versions and has completed a U.S. Bureau Ships 1,000 hr marine qualification program. Interesting applications of these engines include amphibious landing craft, yachts, hydrofoils, high-speed trains (C.N. Turbo-Train) electrical generators and total energy plants.
- 3.4 Prior to significant PT-6 sales UACL's market was largely in repair and overhaul and provision of spare parts for Pratt and Whitney's reciprocating engines. The PT-6 is now entering as a significant element of this market. Total sales over the past five years have risen at an annual rate of 22%. Employment now stands at 5300 people.

4. PAIT Case History - Glulam Products Ltd.
Glue-laminated Wood Beams

- 4.1 Laminated structural wood beams have been used extensively since the close of World War II. They are superior to natural timbers in strength, size, resiliency and functional beauty. Such beams can be expected to increase in importance with the growing scarcity of dimension lumber in the larger sizes.
- 4.2 The conventional method of manufacture of laminated beams was to lay down a board, spread it with glue, add a second board, spread it with glue and so on. Finally, the sandwich is clamped together and the pressure kept on until the glue dries.
- 4.3 Canadian industry improved the early method by devising jigs to accommodate more than one beam at a time, and by heating the beams in ovens to hasten curing of the glue. Unfortunately, the batch cycle time of this process is prolonged, and the associated costs are relatively high.
- 4.4 Glulam Products Ltd. of New Westminster, B.C. conceived an entirely new system by bringing the gluing operation up to the speed and standard of the other stages in the laminating process. By means of a machine of their own invention they proposed to reduce the curing time - the length of time it takes the glue to bond the laminates together - from about 16 hours to between 12 and 30 minutes.
- 4.5 Glulam applied for PAIT assistance in May 1966 and aid under the program was granted in July. An experimental section of the new machine was built by the company at a cost of \$40,500 of which \$20,250 was advanced by the Department through the PAIT program.
- 4.6 The process is now in successful commercial operation in a new \$200,000 capital facility. It is estimated that sales attributable to the project will amount to over \$2 million over the next five years.

5. PAIT Case History - Barringer Research Ltd.
Air Pollution Monitor

- 5.1 Air pollution has in recent years become a matter of vital public interest and concern. In some cases it has already become a serious health hazard. To successfully combat air pollution it is necessary to be able to define and measure the sources of noxious gases. Sulphur dioxide is one of the major gaseous pollutants. For this gas no entirely satisfactory method of measurement existed. The main measurement approaches have been direct, e.g., a sample of gas is drawn by pumps, vents or captured volumes. These direct methods are inconvenient and in some cases not reliable.
- 5.2 Barringer Research Ltd. of Rexdale, Ontario, proposed the development of a rugged instrument for detection and sensing sulphur dioxide. The principle suggested was that of correlating the spectra of gases in the field of view of the instrument with the spectrum of the particular gas whose presence it is desired to determine. The spectrum of the desired gas is previously stored in the instrument. If this gas is present, then correlation occurs and an electrical output results that indicates its presence and concentration.
- 5.3 Barringer Research applied for PAIT assistance to develop two instruments based on the above principle of correlation spectrometry. One for detection using remote sensors and the other for station monitoring and control. The application was received in October 1966 and approved in November. The amount of the PAIT loan was \$122,000.
- 5.4 The development of the instrument was successfully concluded, and there is an active interest in the instrumentation in the export markets. Sales over the next five years are estimated at \$6 million.

6. PAIT Case History - National Sea Products
Atlantic Queen Crab

- 6.1 The development of a commercial queen crab fishing industry in Nova Scotia would provide an additional income and a welcome hedge against the possible decline of the lobster and scallop fisheries.
- 6.2 The existence of the queen crab in the waters off Nova Scotia has been known for many years. It was only about three years ago that the commercial potentialities were recognized. As a first step it was necessary to determine the extent of this resource and to study the characteristics of the queen crab, which is quite different from the Alaskan king crab. This preliminary work was a cooperative venture of the Federal Department of Fisheries, the Nova Scotia Department of Fisheries, fisheries departments in other Maritime provinces, National Sea Products Ltd. and Fishermen's Co-operatives.
- 6.3 Following the preliminary work, National Sea Products of Halifax, N.S. proposed to exploit this substantial potential new fishery. The unique characteristics of the queen crab, particularly its low tolerance to warm surface water required development of new handling and processing methods. Live entry into processing is a prerequisite for quality output. On-ship and land holding facilities, with controlled environmental conditions approximating the natural ones are required.
- 6.4 National Sea Products applied for PAIT assistance to develop the handling and processing equipment. The application was approved in May of 1968 and assistance in the amount of \$40,125 was authorized.
- 6.5 It is not yet possible to evaluate the success of the project, but all indications are favorable. It appears likely that annual sales of \$2 million will be realized beginning in 1970.

7. PAIT Case History - Riley's Reproductions Ltd.
Automatic Digitization of Oil Well Logs

- 7.1 The research efforts of the logging service companies and the major oil exploration companies during the past decade have resulted in a proliferation of geophysical logging devices for use in oil well drill holes. This has resulted in a great improvement in the accuracy of predictions on hydrocarbon reservoirs. The properties that are recorded are temperature, resistance to fluid erosion, natural electric currents, and natural radio-activity.
- 7.2 It is estimated that geologists are using less than 25% of the total information contained in their log files, because of the difficulty and expense in recognizing, separating, and correlating the relevant data in the many log covers recorded for each well bore.
- 7.3 Riley's Reproductions Ltd. of Calgary, Alberta, a company active in the oil well logging field recognized, therefore, the value which would accrue if an accurate, inexpensive method of analysis could be developed.
- 7.4 Riley's Reproductions applied for PAIT assistance to develop a device capable of accepting a graphical analogue record (specifically an oil well log) and converting the information to digital form on magnetic tape within the accuracy limits and standards acceptable to the oil industry.
- 7.5 PAIT assistance for this project was authorized in September 1966. The amount of the approved PAIT loan was \$347,000.
- 7.6 The project was brought to a successful conclusion and the instrument is in commercial use. It is anticipated that the market in the first five years will amount to approximately \$10 million of which a substantial amount will be export business.

8. PAIT Case History - RCA Victory Company
Communications Satellite Earth Stations

- 8.1 RCA Victor of Montreal, P.Q., was granted PAIT assistance of \$200,000 for the engineering development work associated with the operational requirements of commercial type communications satellite earth stations in the international market. The work involved the development of certain networks and sub-systems as well as the performance of necessary systems engineering studies and earth stations systems integration planning.
- 8.2 The work was brought to a successful conclusion and over sales to date of the earth station amount to some \$8 million. The total market for such equipment over the next decade is estimated as up to \$450 million, and the RCA Victor equipment looks well placed to win a substantial share of it.

9. PAIT Case History - Canadair Limited
Amphibious Water Bomber

- 9.1 In the ten-year period from 1953 to 1962, some 58,900 forest fires wrought destruction on 20,044,000 acres of Canada's forests, excluding those of the Northwest Territories and the Yukon. Since the industries based upon forest resources rank first among Canadian producers in value of capital invested, wages paid and exports, these fire losses are a serious threat to the economy. The total loss or damage to the forests for the period in question, \$130,630,000, represents only an estimated market value of the standing timber in the forest; it does not take into account other forest values such as watershed, recreation, wild life or future productivity.
- 9.2 All provinces recognize the many advantages provided by aircraft, either fixed wing aircraft or helicopters, in fighting fires and the majority believe the most promising method of controlling most fires is by water bombing. Water bombing aircraft have not only enabled faster and more effective initial action to be taken on many fires but they have also enabled many more fires to be attacked. This is particularly true in the northern, more inaccessible forest areas. The water bomber also has provided an extension of available manpower enabling crew size to be effectively doubled or tripled because, when assisted by water bombers, a small ground crew is able to control fires ordinarily requiring crews two or three times as large.
- 9.3 Canadair, with PAIT support, undertook to develop a new water bomber/utility aircraft to assist in the advancement of Canadian forest fire fighting technology. It will be the first aircraft in history specifically designed for this purpose. The water bomber will be capable of carrying 1200 Imp. gallons of water which can be picked up while the aircraft is planing at 70 knots on the surface of a lake, river or ocean, which is 50% greater in capacity than conventional water bombers. It will incorporate the latest advances in fire fighting techniques, including chemical additive equipment.
- 9.4 The versatility of the design will allow the aircraft to be exploited in a variety of roles and missions not associated with water bombing, thereby creating a far broader market potential. A number of these alternate uses would include Utility Transport, Agricultural Spraying, Passenger/Cargo, Air Sea Rescue/Military Amphibian and Executive Transport.

9. PAIT Case History - continued

9.5 The development is nearing a successful conclusion. The Province of Quebec and the Government of France have placed firm orders for quantities of 20 and 10 water bombers respectively. Sales of the Water Bomber/Utility and Transport aircraft are estimated at \$90 million over the next three years.

Appendix V

PART III

DEPARTMENT OF INDUSTRY,
TRADE AND COMMERCE

Department established	13. (1) There shall be a department of the Government of Canada called the Department of Industry, Trade and Commerce over which the Minister of Industry, Trade and Commerce appointed 25 by commission under the Great Seal of Canada shall preside.
Minister	(2) The Minister of Industry, Trade and Commerce holds office during pleasure and has the management and direction of 30 the Department of Industry, Trade and Commerce.
Deputy Minister	14. The Governor in Council may appoint an officer called the Deputy Minister of Industry, Trade and Commerce to be 35 the deputy head of the Department of Industry, Trade and Commerce and to hold office during pleasure.
Duties of Minister	15. The duties, powers and functions of the Minister of Industry, Trade and Commerce extend to and include all matters over which the Parliament of Canada has jurisdiction, not by law assigned to any 5 other department, branch or agency of the Government of Canada, relating to <ul style="list-style-type: none"> (a) manufacturing and processing industries in Canada; (b) tourism; and 10 (c) trade and commerce generally.
Further duties	16. The Minister of Industry, Trade and Commerce shall <ul style="list-style-type: none"> (a) promote the establishment, growth and efficiency of manufacturing, process- 15 ing and tourist industries in Canada, contribute to the sound development and productivity of Canadian industry generally and foster the expansion of Canadian trade; 20 (b) develop and carry out such programs and projects as may be appropriate to <ul style="list-style-type: none"> (i) assist manufacturing and processing industries to adapt to changes in technology and to changing conditions 25 in domestic and export markets, (ii) assist manufacturing and processing industries to develop their unrealized potential, to rationalize and restructure their productive facilities 30 and corporate organizations and to cope with exceptional problems of adjustment, and (iii) promote and assist product and process development and increased 35 productivity, the greater use of research, the application of advanced technology and modern management techniques, the modernization of equipment, the utilization of improved 40 industrial design and the development and application of sound industrial standards in Canada and in world trade;

PARTIE III

MINISTÈRE DE L'INDUSTRIE
ET DU COMMERCE

	13. (1) Est établi un ministère du gouvernement du Canada, appelé ministère 20 de l'Industrie et du Commerce, ayant à sa tête le ministre de l'Industrie et du Commerce nommé par commission sous le grand sceau du Canada.	Création du ministère
	(2) Le ministre de l'Industrie et du Commerce occupe sa charge à titre amovible; il a la gestion et la direction du ministère de l'Industrie et du Commerce.	25 Ministre
	14. Le gouverneur en conseil peut nommer un fonctionnaire, appelé sous-ministre 30 de l'Industrie et du Commerce, qui est le sous-chef du ministère de l'Industrie et du Commerce et qui occupe sa charge à titre amovible.	Sous-ministre
	15. Les fonctions et pouvoirs du ministre de l'Industrie et du Commerce englobent toutes les questions qui sont du ressort du Parlement du Canada et que les lois n'attribuent pas à quelque autre ministère, 5 département, direction ou organisme du gouvernement du Canada, concernant <ul style="list-style-type: none"> a) les industries de fabrication et de transformation au Canada; b) le tourisme; et 10 c) le commerce en général. 	Fonctions du ministre
	16. Le ministre de l'Industrie et du Commerce doit <ul style="list-style-type: none"> a) favoriser l'établissement, le développement et l'efficacité des industries de 15 fabrication, de transformation et de tourisme au Canada, contribuer au développement rationnel et à la productivité de l'industrie canadienne en général et encourager l'expansion du commerce au 20 Canada; b) mettre au point et réaliser les programmes et les projets qui peuvent être propres à <ul style="list-style-type: none"> (i) aider les industries de fabrication 25 et de transformation à s'adapter à la fois aux changements technologiques et à l'évolution des conditions des marchés intérieurs et internationaux, (ii) aider les industries de fabrication 30 et de transformation à développer leur potentiel latent, à rationaliser et à restructurer leurs installations de production et leurs organisations corporatives, et à faire face à des problèmes 35 exceptionnels d'adaptation, et (iii) favoriser et aider la mise au point des produits et des procédés et l'augmentation de la productivité, l'utilisation plus poussée de la recherche, 40 l'application de techniques perfectionnées et de méthodes modernes de gestion, la modernisation de l'équipement, l'utilisation de conceptions industrielles améliorées ainsi que l'élaboration 45 et l'application de normes industrielles rationnelles, au Canada et dans le commerce mondial; 	Fonctions supplémentaires

	<p>(c) improve the access of Canadian produce, products and services into external markets through trade negotiations and the promotion of trade relations with other countries and contribute to the improvement of world trading conditions; 5</p> <p>(d) promote the optimum development of Canadian export sales of all produce, products and services;</p> <p>(e) provide support services for industrial and trade development, including information, import analysis and traffic services;</p> <p>(f) analyze the implications for Canadian industry, trade and commerce and for tourism of government policies related thereto in order to contribute to the formulation and review of those policies; 15</p> <p>(g) compile and keep up to date detailed information in respect of manufacturing and processing industries in Canada and of trends and developments in Canada and abroad relating to Canadian industrial development and trade; and 25</p> <p>(h) promote the optimum development of income from tourism and compile and keep up to date detailed information in respect of the tourist industry and of trends and developments in Canada and 30 abroad relating to tourism.</p>	<p>c) faciliter l'entrée des denrées, produits et services canadiens sur les marchés extérieurs, par voie de négociations commerciales et en favorisant les relations commerciales avec les autres pays, et 5</p> <p>d) favoriser l'accroissement optimum des exportations canadiennes de tous les produits et services et de toutes les denrées; 10</p> <p>e) fournir les services de soutien pour le développement industriel et commercial, y compris les services d'information, de trafic et d'analyse des importations;</p> <p>f) analyser la portée, pour l'industrie et 15 le commerce canadiens et pour le tourisme, des politiques gouvernementales y relatives, de manière à aider à formuler et à revoir ces politiques;</p> <p>g) compiler et tenir à jour des renseignements détaillés sur les industries de fabrication et de transformation au Canada et sur les tendances et l'évolution, au Canada, et à l'étranger, en ce qui concerne la mise en valeur de l'industrie 25 canadienne et le commerce canadien; et</p> <p>h) favoriser la croissance optimum des revenus du tourisme, compiler et tenir à jour des renseignements détaillés relatifs à l'industrie touristique ainsi qu'aux tendances et à l'évolution du tourisme au Canada et à l'étranger.</p>	
Further duties	<p>17. The Minister of Industry, Trade and Commerce, in exercising his powers and carrying out his duties and functions under this Part, 35</p> <p>(a) shall, where appropriate, make use of the services and facilities of other departments, branches or agencies of the Government of Canada;</p> <p>(b) may, with the approval of the Governor in Council, enter into agreements with the government of any province or any agency thereof respecting the carrying out of programs for which the Minister is responsible; and 45</p> <p>(c) may consult with, and organize conferences of, representatives of industry</p>	<p>17. Le ministre de l'Industrie et du Commerce, dans l'exercice de ses pouvoirs et fonctions en vertu de la présente Partie, 35</p> <p>a) doit, lorsqu'il y a lieu, utiliser les services et installations d'autres ministères, départements, directions ou organismes du gouvernement du Canada;</p> <p>b) peut, avec l'approbation du gouverneur en conseil, conclure des accords avec le gouvernement de toute province ou avec tout organisme d'un tel gouvernement en ce qui concerne la réalisation des programmes qui relèvent de sa compétence; et 45</p> <p>c) peut consulter des représentants patronaux et ouvriers, des autorités provinciales et municipales et d'autres intérêts</p>	Fonctions supplémentaires
	<p>and labour, provincial and municipal authorities and other interested persons.</p>	<p>sés et organiser des réunions de ces représentants, autorités et autres intéressés.</p>	
Committees	<p>18. The Governor in Council may establish advisory and other committees to advise or assist the Minister of Industry, Trade and Commerce or to perform such duties and exercise such powers as the Governor in Council may specify, and may fix the remuneration and expenses to be paid to the members of the committees so 5 established.</p>	<p>18. Le gouverneur en conseil peut créer des comités consultatifs et autres, chargés de conseiller ou de seconder le ministre de l'Industrie et du Commerce ou d'exercer les fonctions et pouvoirs que peut spécifier le gouverneur en conseil, et il peut fixer le traitement et les dépenses qui seront payés 10 aux membres des comités ainsi créés.</p>	Comités
Annual Report	<p>19. The Minister of Industry, Trade and Commerce shall, on or before the 31st day of January next following the end of each fiscal year or, if Parliament is not then sitting, on any of the first five days next thereafter that Parliament is sitting, submit to Parliament a report showing the operations of the Department of Industry, Trade and Commerce for that fiscal year. 20</p>	<p>19. Le ministre de l'Industrie et du Commerce doit, après la fin de chaque année financière et au plus tard le 31 janvier suivant ou, si le Parlement n'est pas alors en session, l'un des cinq premiers jours où il siège par la suite, présenter au Parlement un rapport exposant l'activité du ministère de l'Industrie et du Commerce au cours de cette année financière. 20</p>	Rapport annuel

Appendix W

Canadian Federal Government Expenditures in Industry for Research & Development, 1958-59 to 1967-68

compared with Gross National Product

	Fiscal Year									
	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
	\$ millions									
Gross National Product	33,093	35,324	35,800	38,225	41,025	44,125	48,450	53,457	59,183	63,084
Research & Development Contracts:										
Department of National Defence	47.5	9.9	10.2	9.4	5.8	8.5	13.4	27.9	16.4	13.1
% Gross National Product	0.1435	0.0283	0.0285	0.0246	0.0141	0.0193	0.0277	0.0522	0.0277	0.0207
Other Departments and Agencies	0.1	3.9	4.5	6.1	4.7	4.2	5.5	7.2	7.8	7.7
% Gross National Product	0.0003	0.0110	0.0126	0.0160	0.0115	0.0095	0.0114	0.0135	0.0132	0.0122
Total R&D Contracts	47.6	13.8	14.7	15.5	10.5	12.7	18.9	35.1	24.2	20.8
% Gross National Product	0.1438	0.0391	0.0411	0.0405	0.0256	0.0288	0.0390	0.0657	0.0409	0.0330
Industrial R&D Assistance Programs:										
Industrial Research & Development Incentives Act	-	-	-	-	-	-	-	-	-	2.1
% Gross National Product	-	-	-	-	-	-	-	-	-	0.0033
Industrial Research Assistance Program	-	-	-	-	0.5	1.6	2.2	3.3	4.2	5.1
% Gross National Product	-	-	-	-	0.0012	0.0036	0.0045	0.0062	0.0071	0.0081
Program for the Advancement of Industrial Technology	-	-	-	-	-	-	-	0.4	4.6	6.4
% Gross National Product	-	-	-	-	-	-	-	0.0007	0.0078	0.0101
Defence Industrial Research Program	-	-	-	-	1.2	2.6	3.8	5.3	4.7	4.5
% Gross National Product	-	-	-	-	0.0029	0.0059	0.0078	0.0099	0.0079	0.0072
Defence Industry Productivity Program	-	1.9	2.9	4.4	8.0	19.0	20.1	21.5	21.2	22.8
% Gross National Product	-	0.0054	0.0081	0.0115	0.0195	0.0431	0.0415	0.0402	0.0358	0.0361
Total R&D Assistance Programs	-	1.9	2.9	4.4	9.7	23.2	26.1	30.5	34.7	40.9
% Gross National Product	-	0.0054	0.0081	0.0115	0.0236	0.0526	0.0539	0.0571	0.0558	0.0648
Total Expenditures in Industry	47.6	15.7	17.6	19.9	20.2	35.9	45.0	65.6	58.9	61.7
% Gross National Product	0.1438	0.0444	0.0492	0.0521	0.0492	0.0814	0.0929	0.1227	0.0925	0.0978

Office Of Science & Technology
Department of Industry, Trade & Commerce,
Ottawa.

APPENDIX 54

DEPARTMENT OF PUBLIC WORKS

BRIEF

TO

SPECIAL COMMITTEE ON SCIENCE POLICY

WAVE CLIMATE STUDY1. Organization

Chart 1 outlines the organizational structure of the Department of Public Works in accordance with the re-organization of the Department implemented during 1967. The Design Directorate, of which the Marine Engineering Division forms a part, is subdivided in chart 2.

As shown on chart 2 the Marine Engineering Division comprises three sections, namely, the Marine Standards, Marine Plant and Marine Structures Sections. A new group is being appended to the latter for a study of the wave climate along the coasts and major lakes of Canada.

2. Organizational Functions.

The basic objective of the Design Directorate is the provision of a central unit of significant engineering experience and skills in the design and construction of roads, bridges, marine structures and plant. This body of experience is available in an advisory capacity and on a request basis, to other areas of the Department as well as to client Departments.

Accordingly, the prime functions of the Marine Engineering Division may be outlined to be :

- (1) Engineering Services - The provision of engineering advice and design and supervision services where these may be requested from within or outside the Department.

- (2) Promulgation of Standards - The development of functional, structural and operational standards.
- (3) Design Evaluation - The evaluation of the design of marine works developed in Regional and District offices of the Department.
- (4) Information System - The development and operation of an efficient information retrieval system, training seminars, conferences, post-graduate studies, etc.
- (5) Consultants Index - The development and operation of an effective information system concerning the technical capacity of consulting engineering firms interested in Departmental marine works.

The Department of Public Works does not possess direct statutory functions and powers regarding scientific activities. Its scientific activities arise from its efforts to perform its functions in the most efficient way.

3. Research Oriented Projects.

During the period 1962 and 1967 inclusive, the following research oriented marine projects were underway in the Marine Engineering Division and the Harbours and Rivers Engineering Branch of which the Marine Engineering Division formed an integral part prior to re-organization of the Department.

- (1) Completion of Littoral Drift Survey on Great Lakes -
The purpose of this project was to develop means of reducing sediment deposition in harbour entrances and channels, with a view to establishing criteria for minimizing maintenance dredging which so often plagues harbour resources. The project was carried out in co-operation with the National Research Council and the Universities of Queen's and Toronto.
- (2) Investigation of the Erosive Effects of Ship Generated Waves in the St. Lawrence -

This project is aimed at establishing standards for the evaluation of federal responsibility for shore erosion caused by navigation and federal structures.

(3) Study of Performance of Floating Breakwaters -

In the constant search for effectively and economically combatting wave energy man has devised many means. Not all these means have general application. The purpose of this study was to evaluate application of floating type breakwaters. It entailed a series of model studies which were carried out through Queen's University.

(4) Study of Wave Induced Erosion Under Breakwaters -

This investigation was initiated as a result of partial collapse of a breakwater and carried out in the laboratory of a private consultant.

(5) Wave Climate Study -

An immediate objective of this study is to collect data on wave conditions on the east and west coast, and major lakes of Canada; and to develop proposals to obtain supplementary wave climate details for areas in which these are lacking. The long term aim of the study is to extend the wave climate data into major sea inlets such as Bay of Fundy, the lower St. Lawrence River and Queen Charlotte Strait.

4. Expenditures Associated with Scientific Activities

Estimates of expenditures incurred on the scientific activities described under 3 - Research Oriented Projects, were as follows. In the case of project No. 5, Wave Climate Study, which is currently being organized, the estimated figure quoted below is that which is anticipated will be incurred.

- | | |
|---|-----------|
| (1) Completion of Littoral Drift Survey on Great Lakes | \$ 75,000 |
| (2) Investigation of the Erosive Effects of Ship Generated Waves in the St. Lawrence. | \$ 15,000 |

(3) Study of Performance of Floating Breakwaters	\$ 10,000
(4) Study of Wave Induced Erosion Under Breakwaters	\$ 10,000
(5) Wave Climate Study (1968-74)	\$750,000

5. Personnel in Research Oriented Projects.

The Marine Engineering Division is constituted of permanent officers of a high degree of expertise in Marine Engineering. Casual engineers are employed as the work load may require their quality or quantity. For the Wave Climate Study which is just being started two engineers are being employed on term basis. These two engineers will be headed by Mr. L. Draper of the National Institute of Oceanography of the U.K. who has an established reputation in the field of Wave Climate studies for engineering purposes. Mr. Draper is expected to stay with the study group for approximately one year. Particulars of the group are detailed in the following table.

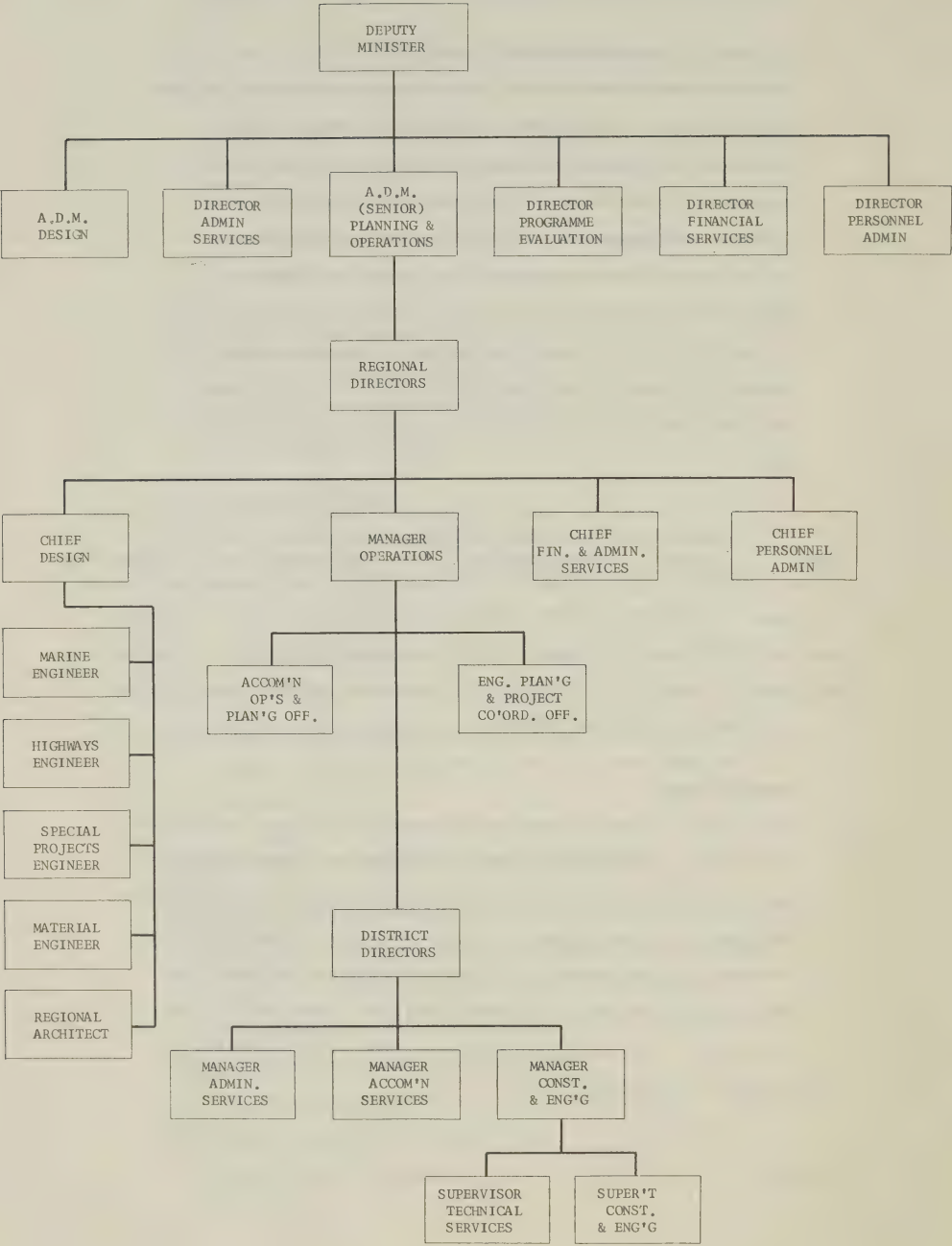
Name	Country of Birth	Country of Education			Date of Employment	Age (Ave.)	Language
		Secondary	B.Sc.	M.Sc.			
L. Draper	U.K.	U.K.	U.K.	U.K.	Oct.68		English
H.J. Wu	Formosa	Canada	Canada	Canada	Sept.68		English
W.F.Baird	U.K.	U.K.	U.K.	Canada	Sept.68	30	English

6. Research Output

The research output of the Marine Engineering Division is implicit in its function as an advisory body. Apart from this direct output to agencies seeking consultation from the Division, information of general application is disseminated in the form of papers at seminars which are conducted annually between the District and Regional offices of the Department and the Marine Engineering Division. Opportunities are also taken of addressing national and international conferences on subjects of scientific value.

Special Committee

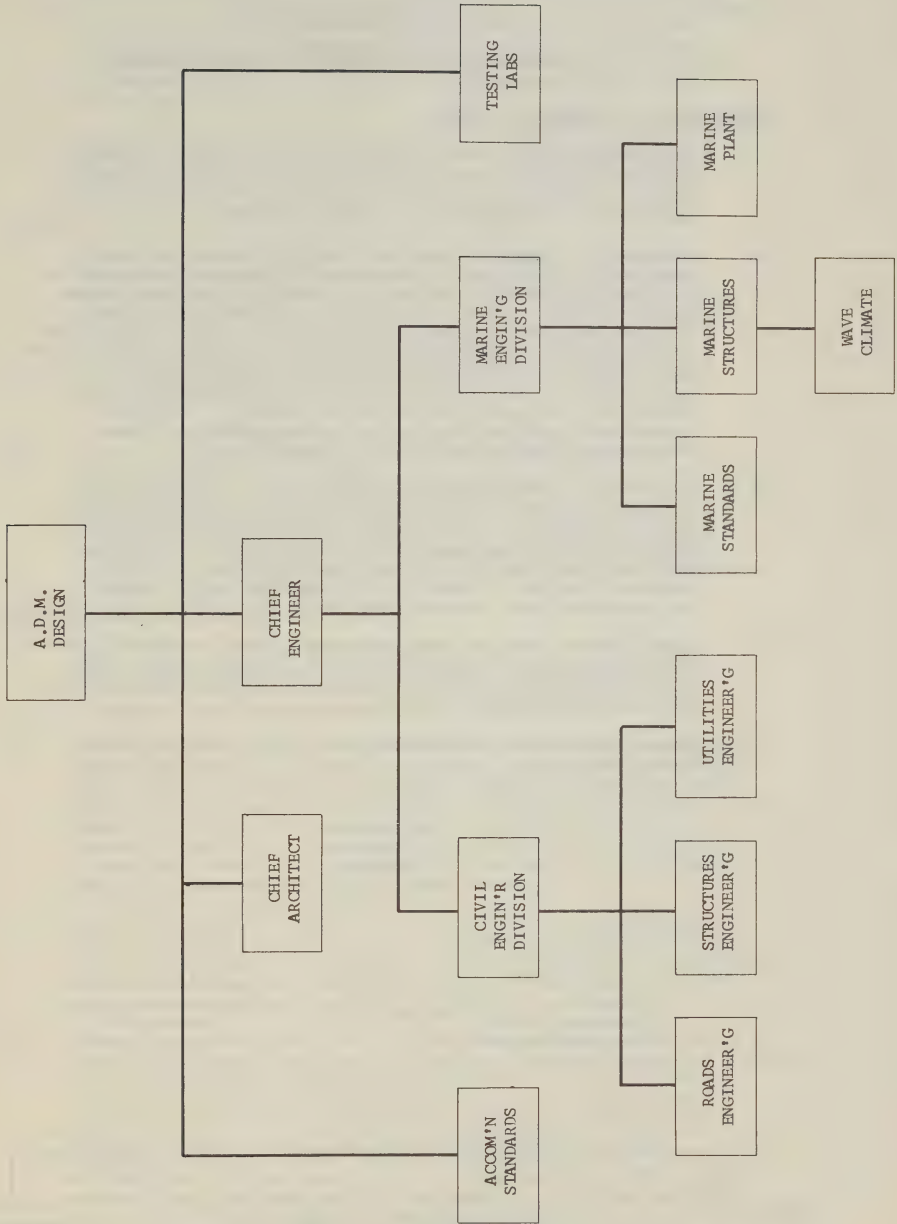
DEPARTMENT OF PUBLIC WORKS
ORGANIZATION CHART 1



DEPARTMENT OF PUBLIC WORKS

ORGANIZATION CHART 2

DESIGN DIRECTORATE



APPENDIX 55

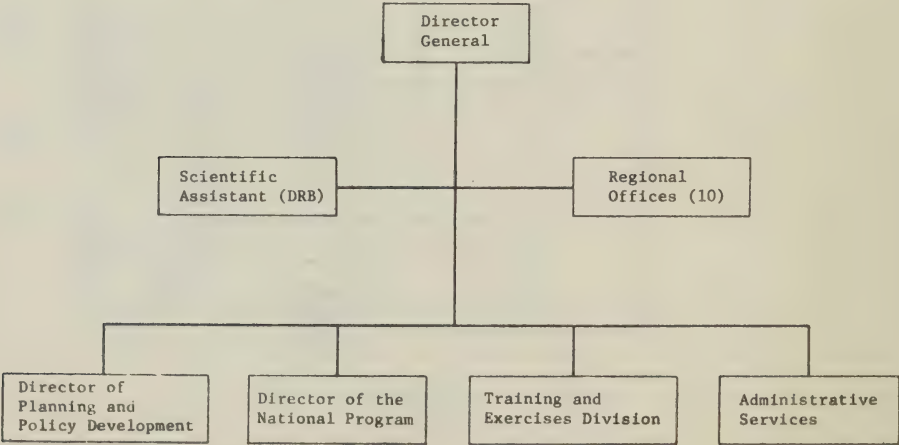
SCIENTIFIC ACTIVITIES IN THE CANADA EMERGENCY MEASURES ORGANIZATION

A BRIEF PREPARED FOR

THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICY

ORGANIZATION OF EMERGENCY PLANNING

1. The Canada Emergency Measures Organization is a separate identity component of the Department of National Defence within the Deputy Minister's branch. Its prime responsibility is the planning and coordination of all nonmilitary defence measures.
2. World War II showed that major war has a profound effect upon many aspects of the social, economic and governmental organization of a combatant country even when that country is not under direct attack. In the event of a future full scale armed attack upon the North American continent the survival of any part of the nation and its eventual recovery would be dependent upon the ability of the whole national structure to perceive and react to the threat, to take such actions as would minimize the overall vulnerability to the effects of attack and to reorganize for recovery. The overall planning and coordination of all measures essential to these objectives is the responsibility of Canada EMO.
3. It is basic to modern systems organization that the ability for emergency reaction and adaptation must be developed by the agency or authority which has the normal non-emergency responsibility. Thus each federal department, each provincial authority and each municipal government has a defence responsibility for civil emergency planning. Canada EMO is designed to assist, support and coordinate these emergency measures.
4. At the federal level the civil emergency planning responsibilities of departments are set forth by Orders in Council. (Annex "A") Canada EMO is charged with the overall responsibility of coordination and financial management.
5. Canada EMO has a staff of approximately 100 persons organized as shown below:



NEED FOR SCIENTIFIC SUPPORT IN EMERGENCY PLANNING

6. There are three main areas in emergency planning where scientific support and research are essential. The first of these is concerned with determining the probable direct physical effects of modern weapons and weapons systems used against the North American continent. The second concerns the more complex problems of the indirect effects of attack upon the various systems and components in our complex social, economic and governmental structure. The third area is concerned with the examination of various options in passive defence and the determination of their individual and overall costs and effectiveness.
7. For some years a list of problem areas and research requirements has been widely circulated by Canada EMO within Canadian industry and universities. This is attached as Annex "B".

PROVISION OF SCIENTIFIC SUPPORT TO EMERGENCY PLANNING

8. The Defence Research Board has continued to provide a broad base of scientific support for Canada EMO and the various parts of the federal emergency planning community. This has ranged from projects in various DRB laboratories to operational and analytical research studies by headquarters groups. A Scientific Adviser has been provided from DRB to the Director General of Canada EMO and a branch of the Defence Scientific Information Services is located in Canada EMO headquarters.
9. In order to provide a balance capability to develop a national program of emergency measures it has been necessary to provide certain engineering and economic support services which were not already available within the emergency planning community. These are the Protection Division and the Economic Planning Division of Canada EMO. Reports from these groups are attached at Annex "C" and Annex "D". Both groups have undertaken and sponsored research studies which are within the areas of interest to the Senate Committee.

INTERDEPARTMENTAL RESEARCH COORDINATION

10. There is a further Canada EMO research coordination activity which might be of real intrinsic interest because of its applicability to extramural research in general. This is the contingency funding arrangement provided by the Scientific Adviser.
11. After an initial general examination of both intramural and extramural research undertaken in support of emergency planning it was concluded that in many areas where data and understanding were urgently needed there was in fact latent support available both within universities and industry. However, this potential support seldom materialized for a variety of reasons; the two main ones arising from the very smallness of some departmental emergency planning groups and the general lack of flexibility in financial planning and budgeting.
12. Small groups are usually unable to solicit needed extramural support because of their inability to obtain recognition and priority within large existing departmental extramural research programs or because of their lack of time and travel funds needed to become acquainted with university and industrial research potential.
13. Lack of financial flexibility has resulted in some emergency planning groups in the federal departments being out of touch with academic research support opportunities. Quite often a university department head in planning his graduate program becomes aware of a need for financial support or of an opportunity to assign a competent graduate research student to a particular investigation during the three or four months preceding the academic year. When he then approaches a government agency he finds that all funds available from the government's current year's appropriations have been committed and possibly that it is even too late to include funds in the following year's budget. So he is then told to go away and come back in a year or two. Of course by then the capability for undertaking the research may well have disappeared.

14. In order to avoid both of the above problems the office of the Scientific Adviser in Canada EMO sought and obtained a small unassigned research coordination fund which could be used on an opportunistic basis to initiate research programs. Certain ground rules evolved. These were:
- a. The office of the SA/Canada EMO would acquaint industry and universities with the research interests of the entire emergency planning community.
 - b. All proposals would be referred to the SA/Canada EMO who would be responsible for their appraisal and for the determination of whether one or more departmental groups would be willing to undertake funding at the first budgeting opportunity.
 - c. The SA/Canada EMO would also determine whether the potential funding agency would undertake responsibility for sponsorship and project supervision.
 - d. If it was decided that a particular research proposal was in the real interest of emergency planning, and if it was found that one or more departmental emergency planning authorities would undertake immediate supervision and future funding at the first budgeting opportunity, a financial encumbrance was transferred to the sponsoring department to provide the funds necessary to initiate the project and carry it until departmental funds were available. A number of projects have been handled in this manner and details are provided at Annex "E". Past funding and anticipated future requirements are indicated below:

Year	Projects Initiated	Funds Transferred
1964-65	1	\$ 7,500
1965-66	2	7,200
1966-67	2	7,450
1967-68	4	58,050
1968-69	Nil to date	Funds anticipated 10,000

15. The possible advantages of a central clearinghouse with a substantial unencumbered research fund might well be examined on a much broader functional basis within all the government departments and agencies.

EVOLVEMENT OF A SCIENTIFIC POLICY FOR CANADA EMO

16. Policies within the various departmental emergency planning groups reflect the rules and practices of the parent department to a great extent. However, there are certain fundamental principles which Canada EMO attempts to observe. These are as follows:
- a. Canada EMO will not normally provide any funds for research grants. These will eventually form a more significant part of the DRB extramural program.
 - b. Canada EMO will normally negotiate short term extramural applied research contracts in support of specific planning, programming and coordinating needs.

- c. Canada EMO will not normally provide capital equipment to research contractors.
- d. When research support is required it will normally be sought first from DRB, NRC or other federal departmental research facilities. Universities may be invited to offer proposals but care will be taken to avoid preferential treatment.
- e. Wherever possible, extramural projects will be of a joint Canada EMO - departmental nature with joint project planning.
- f. All research contract proposals will be reviewed in the first instance by the departmental emergency planning groups with related interests.

e.g.: Structures ---- NRC Bldg. Res., DPW, CMHC
 Economics ---- ESPB, Finance, DBS
 Biology ---- EHS, NRC (Rad. Lab.)

- g. Canada EMO will maintain a research contingency fund on behalf of the emergency planning community. Project direction and subsequent funding will rest with the sponsoring department or departments.
- h. All research contract final reports must be accepted before contract close-out. All reports will normally be released to NATO and Commonwealth countries without delay.

FUNCTIONAL ANALYSIS OF EMERGENCY PLANNING

- 17. During the first six months of 1968 an interdepartmental federal-provincial study group completed a functional analysis of emergency planning and outlined a complete plan of planning programming and budgeting for the overall effort. This has been identified as Project Phoenix. Appended to the Project Phoenix report was a list of 51 study areas. This is attached at Annex "F".

SCHOLASTIC SUPPORT

- 18. The office of the Scientific Adviser Canada EMO administers a fellowship program at the Ohio State Disaster Research Center. (See Annex "G") A \$5,000 per year, three year award is made each year to an MSc level Canadian sociologist. The award is designed to carry selected students to the PhD level and to give them actual research experience in the response of social systems to disaster stress. This program of awards began in 1966. Past and future funding is indicated below:

1966-67	1967-68	1968-69	1969-70	1970 to 1975
\$5,000	\$5,000	\$10,000	\$15,000	\$15,000 per year

SUMMARY
CANADA ENO SCIENTIFIC PROGRAM 1962-1975
AREA OF APPLICATION - DEFENCE.

FISCAL YEAR	INTRAMURAL RESEARCH (Includes salaries equipment & supplies)		EXTRAMURAL										TOTALS		
			Industry and Consultants		Other Federal Departments and Agencies		Academic								
							Engineering and Development	Economics	Engineering and Development	Economics	Engineering and Development	Geography		Sociology	Biology
1962-63	75,000	14,000		9,000	-	-	-	-	-	-	-	-	-	-	48,000
1963-64	29,000	22,000		2,000	13,500	-	41,300	-	-	-	-	-	-	-	107,800
1964-65	52,100	23,500		6,000	9,000	-	53,500	1,500	-	-	-	-	-	-	145,600
1965-66	44,600	29,000		28,000	30,000	-	46,000	39,600	-	5,000	-	-	-	-	222,200
1966-67	65,000	30,000		38,000	51,500	6,000	56,000	41,900	-	5,000	4,000	-	-	-	297,400
1967-68	48,600	25,000		44,500	65,000	6,000	118,000	98,600	18,000	10,000	7,550	-	-	-	441,250
1968-69	52,600	19,000		15,500	60,000	16,000	30,000	180,800	20,500	15,000	-	-	-	-	409,400
TOTALS	216,900	162,500		143,000	229,000	28,000	344,800	362,400	38,500	35,000	11,550	-	-	-	1,664,650

ANNEX "A"

P.C. 1965-1041

AT THE GOVERNMENT HOUSE AT OTTAWA

TUESDAY, the 8th day of JUNE, 1965.

PRESENT:

HIS EXCELLENCY

THE GOVERNOR GENERAL IN COUNCIL..

His Excellency the Governor General in Council, on the recommendation of the Minister of Defence Production, pursuant to paragraphs (g) and (h) of subsection (1) of section 2 of the Civil Service Act, to paragraphs (a) and (f) of Section 2 of the Financial Administration Act, to the Public Service Re-arrangement and Transfer of Duties Act and to any enactment of the Parliament of Canada for defraying the several charges and expenses of the public service from and after 1st April, 1965, that provides for payments in respect of the planning of civil emergency measures and the continuity of government in a national emergency, is pleased hereby to revoke Civil Defence Order, 1959 made by Order in Council P.C. 1959-656 of 28th May 1959, as amended, by Order in Council P.C. 1963-993 of 27th June 1963, and to make the annexed Civil Emergency Measures Planning Order in substitution therefor.

CERTIFIED TO BE A TRUE COPY

R.G. Robertson
Clerk of the Privy Council

TO

HIS EXCELLENCY

THE GOVERNOR IN COUNCIL:

The undersigned has the honour to recommend that your Excellency in Council, pursuant to paragraphs (g) and (h) of subsection (1) of section 2 of the Civil Service Act, to paragraphs (a) and (f) of section 2 of the Financial Administration Act, to the Public Service Rearrangement and Transfer of Duties Act and to any enactment of the Parliament of Canada for defraying the several charges and expenses of the public service from and after 1st April, 1965, that provides for payments in respect of the planning of civil emergency measures and the continuity of government in a national emergency, be pleased to revoke Civil Defence Order - 1959 made by Order in Council P.C. 1959-656 of 28th May 1959 as amended by Order in Council P.C. 1963-993 of 27th June 1963, and make the annexed Civil Emergency Measures Planning Order in substitution therefor.

Minister of Defence Production

ANNEX "A"CIVIL EMERGENCY MEASURES PLANNING ORDER

1. This Order may be cited as the Civil Emergency Measures Planning Order.

2. In this Order, the expression "civil emergency powers, duties and functions" includes powers, duties and functions relating to "preparation for civil defence against enemy action" mentioned in section 4 of the National Defence Act.

3. Each Minister of a department, agency or Crown corporation of the Government of Canada which is listed in the Schedule shall henceforth exercise and perform and, while Sections 3 to 5 of the War Measures Act are not in force, shall continue to exercise and perform, in conjunction with the powers, duties and functions that such Minister is ordinarily expected or required to exercise and perform, the following powers duties and functions, namely:

- (a) make such preparations as are required to enable him to exercise and perform the civil emergency powers, duties and functions set out opposite his name in the Schedule:
- (b) provide necessary assistance and advice to provinces and through the provinces, as requested, to municipalities either to enable those governments to plan emergency measures which lie within their constitutional responsibilities or to supplement the measures being planned by the Minister.

4. Each Minister referred to in Section 3 shall ensure that, where preparations for the exercise and performance of civil emergency powers, duties and functions are to be made in conjunction with agencies or departments of foreign governments, the plans therefor are co-ordinated by the Minister of Industry through the Emergency Measures Organization, with the concurrence of the Secretary of State for External Affairs.

ANNEX "A"

5. The Minister of each department, agency or Crown corporation of the Government of Canada shall

- (a) at all times, provide the minister of any department, agency or Crown corporation who is assigned emergency planning responsibilities under Section 3 with such assistance as may be required, having regard to existing commitments, to enable him to plan for and to exercise and perform those powers, duties and functions, including the provision of services and the loan of personnel who have been assigned emergency duties;
- (b) be responsible for the preparation and implementation of plans that will provide for the resumption of the normal functions of that department, agency or Crown corporation in the event that such functions are suspended as a result of acts of war;
- (c) prepare and implement plans for the warning and dispersal of employees at the time of a National Alert or when so ordered by the Governor in Council; and
- (d) inform all employees of departmental plans for both peace and war emergencies, including information on personal survival measures.

6. Notwithstanding section 3, the Minister of Transport shall not be responsible for making preparations for the control of road transport.

7. The Minister of National Defence shall, in addition to making preparations and providing assistance and advice as prescribed by section 3, perform the duties and functions set out in subitems (1) to (3) of section 8 of the Schedule.

8. The Minister of Industry shall, through the Emergency Measures Organization,

- (a) develop policies and a programme to ensure the continuity of government in an emergency;
- (b) co-ordinate civil emergency planning and training by departments, agencies and Crown corporations of the Government of Canada;

ANNEX "A"

- (?) Manage any government-sponsored stockpile of supplies, except military and medical supplies.
3. External Affairs
- (1) Assess the international situation and report to Cabinet on international developments.
- (2) Conduct relations with foreign governments and international organizations.
- (3) Protect Canadian interests in other countries
- (4) Participate in information activities abroad in consultation with other interested government departments and agencies, including the provision of general policy guidance to the International Service of the Canadian Broadcasting Corporation.
- (5) Maintain and operate communications facilities for purposes described in subitems (1) to (4)
- (6) Assist and advise other departments on matters having international implications.
- (7) Interpret, in consultation with other departments as appropriate, treaties and other international agreements to which Canada is a party.
4. Finance
- (1) Through the Department of Finance,
- (a) provide and control the use of funds to cover normal and emergency federal expenditures, including emergency financial assistance to provinces and emergency financial assistance to essential business operations;

ANNEX "A"

- (b) advise Cabinet respecting the imposition of emergency taxes and other fiscal measures;
 - (c) advise Cabinet of the priorities to be given to competing demands on the financial and economic resources of the country, in collaboration with other departments;
 - (d) advise Cabinet on and take measures to implement financial moratoria if required; and
 - (e) assess the financial situation generally in the country and propose such further emergency controls and operations as appear to be required.
- (2) Through the Bank of Canada,
- (a) assess the availability of and restore and direct the operation of banking and related facilities and services;
 - (b) advise Cabinet on the need for and, if directed so to do, establish and operate a foreign exchange control system; and
 - (c) perform those normal functions of the Bank of Canada that are required in the circumstances, including serving as the fiscal agent of the Government.
5. Fisheries
- (1) Assume control over all fish catching, landing and processing operations up to the point where consumable fishery products enter into storage or directly into distribution channels.

ANNEX "A"SCHEDULE

<u>COLUMN I</u>	<u>COLUMN II</u>
Item Minister	Civil emergency powers, duties and functions
1. Agriculture	<p>(1) Be responsible for farm production including the provision of advice and guidance to farmers on the protection of farms, crops and livestock against wartime hazards such as radiation.</p> <p>(2) Be responsible for inspection and regulatory functions relating to</p> <ul style="list-style-type: none"> (a) the quality and wholesomeness of food, except fishery products; (b) the freedom of such food from an unacceptable degree of radioactive contamination; and (c) plant, animal, insect and disease control. <p>(3) Make post-attack assessments of the availability of farms, crops and livestock.</p> <p>(4) Provide assistance and advice to provincial governments respecting the establishment of a combined federal-provincial organization to carry out the civil emergency powers, duties and functions set out in subitems (1) to (3)</p>
2. Defence Production	<p>(1) Establish a War Supplies Agency to</p> <ul style="list-style-type: none"> (a) make post-attack assessments and determine the availability of surviving resources of food, energy, ready-to-use survival materials, production facilities and raw and

ANNEX "A"

semi-processed materials;

- (b) assess supply requirements based on claims submitted by other departments and agencies at all levels of government, compare requirements with availabilities, and make reconciliation of competing claims and establish priorities as required;
- (c) make arrangements for control and bulk redistribution of food, energy, survival materials and other essential commodities including those in government-owned stockpiles, except articles and equipment under the control of the Canadian Forces or in medical stockpiles;
- (d) regulate internal and external trade, particularly with respect to rationing, price control and foreign trade;
- (e) procure by purchase, requisition, or other means, all goods and supply services required by government for civil and military purposes;
- (f) control international supply transactions and maintain effective liaison for this purpose with supply agencies established by NATO or its members, especially the United States of America; and
- (g) control industrial production, including the allocation of raw and semi-processed materials.

ANNEX "A"

- (c) in conjunction with provincial authorities, develop policies and a programme for the control of civil road transport resources in an emergency;
- (d) plan civil emergency measures in respect of matters that are not the responsibility of any department, agency or Crown corporation of the Government of Canada or recommend to the Governor in Council the assignment of such responsibility to a Minister;
- (e) provide assistance and guidance to provincial governments and municipalities in respect of the preparation of civil emergency measures in matters that are not the responsibility of any department, agency or Crown corporation of the Government of Canada;
- (f) with the concurrence of the Secretary of State for External Affairs, provide general liaison with other countries and with the North Atlantic Treaty Organization on matters relating to civil emergency measures including the co-ordination of planning of those matters by other departments, agencies and Crown corporations; and
- (g) be responsible for the direction and administration of the Canadian Civil Defence College.

9. The Emergency Measures Organization is designated a "Department" for the purpose of the Civil Service Act and the Financial Administration Act.

10. The Director of the Emergency Measures Organization is designated the Deputy Head of the department for the purposes of the Civil Service Act and the Financial Administration Act and shall act as deputy for the appropriate Minister.

11. The Minister of Industry is the appropriate Minister with respect to the Emergency Measures Organization for the purposes of the Financial Administration Act.

12. Where, in the Public Service Superannuation Regulations, a responsibility is placed on a deputy head, that responsibility shall, in respect of the Emergency Measures Organization, be exercised by the Director.

13. Where any matter set out in the Schedule would but for this Order, be a power, duty or function of a Minister other than the Minister to whom it is assigned in the Schedule, that power, duty or function is hereby transferred to the Minister to whom it is assigned in the Schedule.

ANNEX "A"

- (2) Make post-attack assessments to determine the extent of survival of fishermen, fishing vessels and gear, fish processing plants and fishery products in storage.
- (3) Requisition or appropriate, or procure by contract or agreement as required the services of fish producers, fishery products, fishing vessels and gear used in catching fishery products, fish plants, fish processing equipment and dockside facilities, other than government wharves and piers, required for landing such products.
- (4) Carry out inspection procedures to determine
 - (a) whether a fishery product is suitable for consumption; and
 - (b) the extent, if any, of radioactive contamination of fishing vessels, plant and equipment and fishery products.
- (5) In collaboration with other agencies of government, control the movements of and protect Canadian fishing vessels in the territorial sea of Canada, the fishing zones of Canada and on the high seas.

6. Justice

- (1) Through the Department of Justice,
 - (a) formulate and implement emergency measures and advise Cabinet in connection therewith;
 - (b) advise other departments and agencies on legal problems that

ANNEX "A"

may arise in connection with the re-establishment and maintenance of the normal functions of government; and

- (c) perform in relation to the emergency, the normal duties and functions of the Department of Justice.

(2) Through the Royal Canadian Mounted Police,

- (a) exercise responsibility for
 - (i) the internal security of Canada in all matters of subversion and espionage
 - (ii) the protection of specified Vital Points
 - (iii) Port and Travel Security Control,
 - (iv) the administration and operation of civilian internment camps, and
 - (v) the providing of assistance to other services and departments in the identification of persons unable to identify themselves;
- (b) exercise responsibility, in accordance with the police jurisdiction of the R.C.M. Police and in cooperation with other police forces, for the internal security of Canada in all matters of sabotage and police assistance in the enforcement of

ANNEX "A"

federal statutes and
emergency legislation; and

- (c) assist provincial and municipal governments and their police forces, as requested, in all matters pertaining to the co-ordination of emergency police planning and operations.

7. Labour

(1) Establish a National Emergency Manpower Authority to

- (a) formulate emergency manpower policies and recommend any necessary legislation relating thereto;
- (b) control and allocate all civilian manpower, except those persons exempted from the authority of the Minister of Labour;
- (c) establish and maintain schedules of manpower priorities and of critical occupations, in co-ordination with related priority policies of other departments and agencies;
- (d) control rates of remuneration of employees;
- (e) regulate and control labour-management relations and conditions of employment; and
- (f) provide estimates of the surviving population, as well as collect and make available data on manpower supply and demand, wage rates and other matters relating to manpower.

8. National
Defence

(1) Provide technical facilities and operate a system to give warning to the public of the likelihood and imminence of an attack.

ANNEX "A"

(2) Provide technical facilities and operate a system to determine the location and yield of nuclear explosions together with the predicted and actual patterns of fallout and, in conjunction therewith,

(a) give the necessary warnings of fallout to the public;

(b) prepare preliminary estimates of casualties and weapons effect data from which physical damage or other hazards may be estimated; and

(c) co-ordinate and collate nuclear activity data from other available sources.

(3) Provide, maintain and operate a communications system for the national emergency government.

(4) At the request of the Regional Commissioner or, if communications are not available, as may be necessary, control, direct and co-ordinate all survival operations in areas damaged by nuclear explosions or seriously contaminated by radioactive fallout, including

(a) the conduct of necessary operations, including rescue, first aid to the injured and decontamination;

(b) the maintenance of law and order, the control of traffic, and the movement of people;

ANNEX "A"

- (c) the allotment of fire-fighting and police tasks;
- (d) the allotment of tasks for the restoration and maintenance of essential public utilities and services;
- (e) in conjunction with provincial emergency
 - (i) casualty sorting and initial emergency medical care; and
 - (ii) casualty evacuation; and
- (f) during operations, the co-ordination of such support as may be required by civil agencies working under the direction or control of the Canadian Forces.

(5) Provide, as requested, and having regard to other commitments at the time, emergency support to provincial and municipal authorities in the conduct of any survival operations that may be undertaken by these authorities during an emergency.

9. National
Health &
Welfare

(1) Be responsible, through an Emergency Health Services organization, for

- (a) assistance and advice to provincial and municipal governments and other agencies in the operation of emergency medical, nursing, hospital and public health services, and in the health aspects of the provision of potable waters;
- (b) assistance to provincial and municipal governments in the provision of medical and health supplies from the national medical stockpile;

ANNEX "A"

- (c) the inspection and regulation of health standards for drug and pharmaceutical manufacture;
- (d) advice to the War Supplies Agency in the manufacture, procurement and distribution of medical and health supplies;
- (e) the establishment of regulations covering the health standards for food and food products, including the permissible levels of radioactive contaminations;
- (f) the control and allocation of medical professional manpower, other than members of the Canadian Forces, including physicians, dentists and nurses, and the direction or supervision of allied health manpower allocated to Emergency Health Services;
- (g) medical advice to departments and agencies on the health hazards of radiological, biological and chemical warfare and on general health problems;
- (h) detailed medical estimates of traumatic and radiation injuries;
- (i) an estimate of damage to medical installations and an assessment of surviving medical manpower; and
- (j) the co-ordination of medical mutual support action between the provinces and between

ANNEX "A"

Canada and the United
States of America.

(2) Be responsible, through an
Emergency Welfare Services
organization, for

- (a) assistance to provincial
and municipal governments
in the operation of
emergency welfare services
consisting of emergency
feeding, clothing, lodging,
registration and inquiry
and personal services,
including
 - (i) the control and
allocation of federal
welfare material and
assigned personnel
resources, and
 - (ii) in consultation with
other departments,
advice, on priority
use of essential
survival resources,
both material and
personnel, available
throughout the
country;
- (b) operating emergency welfare
services within a province
or provinces where adequate
services are not being
provided, including the
priority requisitioning of
accommodation for emergency
lodging purposes during the
immediate survival phase
following a nuclear attack;
and
- (c) co-ordinating welfare
mutual support action
between the provinces and
between Canada and the
United States of America.

10. Postmaster
General

- (1) Operate postal services under
emergency conditions.
- (2) Distribute and handle emergency
change of address and safety
notification cards.

11. Public
Works

(1) Establish, in conjunction with the provincial authorities, a wartime organization responsible through central, regional, zonal and local authorities for the control of all accommodation, except accommodation under the control of the Canadian Forces, including

(a) the use of all exist- and unseable accommodation, including the requisitioning, appropriation and procurement of property, dwellings, commercial and industrial accommodation, except that during the shock phase these controls may be exercised also by Emergency Welfare Services and other emergency government services delegated such authority;

(b) rent and sale controls; and

(c) the allocation of re-habilitated or newly constructed accommodation.

(2) Through Central Mortgage and Housing Corporation assist the provincial authorities in the general co-ordination and implementation of emergency housing construction programmes, including the provision of the associated water, sewage and other utility services.

(3) Assist the provincial authorities with wartime maintenance and construction programmes for roads and road bridges, and co-ordinate the inter-regional and international aspects of such programmes.

ANNEX "A"

- (4) Establish in conjunction with the provincial authorities a wartime organization responsible through central, regional, zonal and local authorities for the control of all engineering and construction resources, except those under the control of the Canadian Forces, or other exempted emergency government services including
- (a) The direction, control and regulation of the engineering resources represented by the equipment, material and assigned manpower of engineering and construction contractors, including the various sub-trades and consultant and other engineering services, and of government at all levels, except that during the shock phase, these controls may be exercised also by the Canadian Forces and other emergency government services delegated such authority;
 - (b) the co-ordination of demands for engineering and construction resources and the allocation of those resources to meet priorities that are approved by the executive authority at the appropriate level of government; and
 - (c) the co-ordination of demands on the War Supplies Agency and the National Emergency Manpower Authority for engineering and construction equipment and manpower.
- (5) Arrange, in conjunction with other departments and agencies concerned, for the provision of technical support and assistance to the General Transport Controller in the maintenance, repair, reconstruction and construction of

ports, harbours and inland
Waterway facilities.

12. Transport

(1) Place under federal government control all transportation, meteorological and tele-communications resources, facilities and services in Canada, except those operated by the Canadian Forces, those vessels, facilities and services under the control of the Minister of Fisheries, and the tele-communications facilities operated by the Department of External Affairs.

(2) Establish and operate an emergency transportation control organization capable of functioning under national, regional, zonal and municipal authorities, as appropriate, to

- (a) control all types of transportation facilities and services in Canada, including ports, harbours and inland waterways and including the direction of fishing vessels in Canadian waters under the control of the Minister of Fisheries if required for survival operations, but excluding transportation facilities operated by the Canadian Forces; and

direct the employment of all types of transportation to essential tasks for the survival of Canada as a nation.

(3) Establish, in collaboration with the Department of National Defence, an organization capable of functioning on the basis of decentralized authority during the period of an emergency,

ANNEX "A"

- (a) until the N.A.T.O. Defence Shipping Authority is activated, to provide civilian direction and naval control to national and N.A.T.O. shipping in Canadian waters and national shipping on the high seas; and
 - (b) after the Defence Shipping Authority has been activated, to control canadian shipping and form an element of the Defence Shipping Authority in support of national requirements and N.A.T.O.
- (4) Establish and operate an Emergency National Tele-communications organization capable of functioning on the basis of decentralized authority to control all forms of tele-communications, including broadcasting.
- (5) Assess available transportation, meteorological and tele-communications resources, except those operated by the Canadian Forces.
- (6) Provide maximum support to tasks accepted by Canada as a member of the North Atlantic Treaty Organization and co-ordinate mutual transport, telecommunications and meteorological action between Canada and the United States of America.
- (7) Through the Canadian Broadcasting Corporation provide an emergency broadcasting service on an international, national and provincial basis over the facilities of the Canadian Broadcasting Corporation and privately-owned stations, including the operation of such facilities as required, such broadcasting to be co-ordinated to meet the general requirements of Canadian and N.A.T.O. civil emergency plans.

RESEARCH AND DEVELOPMENT
FOR
EMERGENCY PLANNING

The Canada Emergency Measures Organization recently distributed a list of subjects and areas of research which are of current interest in emergency planning. There have been numerous enquiries concerning the availability of financial support and it has been decided to give a more detailed description of the Canadian organization for emergency planning and the circumstances under which financial support might be obtained.

In the various government structures of Canada there are a number of services and functional responsibilities which are considered essential to the maintenance of organized society. It is the stated policy of the Canadian government that each and every department or agency which has a peacetime responsibility for one or more of these essential services or functions also has the full responsibility to plan how these will be carried out effectively under emergency conditions. This principle is considered to apply to all levels of government from municipal to federal.

In many of the departments of the federal government, relatively small emergency planning groups have been established; all of the Provinces have set up emergency planning offices; many municipal authorities have appointed emergency planners. Canada EMO was established 1957 to provide coordination and essential support to the overall emergency planning effort.

Most emergency planning sections in the federal government are relatively small and have to plan their financial requirements a year in advance. Therefore research opportunities have sometimes been neglected because departmental funds were not available on an opportune basis. Canada EMO has attempted to correct this situation - at least to some degree - by establishing a small research contingency fund which is at the disposal of all emergency planning authorities. The conditions for aid from the contingency fund are that one or more emergency planning authorities must be willing to accept sponsorship, direction and control of the project concerned and that they must provide funds for continued support at the first budgetary opportunity. In effect this arrangement helps bridge the discrepancy between the academic and the fiscal year.

During 1965 the Scientific Adviser to Canada EMO consulted all emergency planners to determine which areas of science and technology were of direct and immediate concern to their particular responsibilities. These were listed and the list distributed in 1965. A revised edition was issued in 1967.

The following may be said about each item on the list:

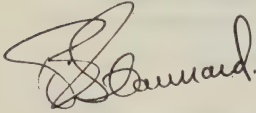
- (a) There is a direct interest by one or more emergency planning authorities at some level of government;
- (b) There may be an existing fund of relevant scientific literature;
- (c) There may be an existing program of research either in Canada or in an associated country;
- (d) There may be a need to undertake research where capability and opportunity exist.

Researchers should review the list (as attached) with the above points in mind. If they have competence in a particular subject and particularly if they have an existing research program they should know that one or more planning authorities have an active parallel interest. Information on this point may be obtained from Canada EMO. Under similar circumstances they should also know that there is a possibility that the Scientific and Technical Information Centre of Canada EMO might be able to provide background literature which might not normally be available. Furthermore Canada EMO might be able to advise them on similar or related research efforts in Canada or abroad.

ANNEX "B"

Finally there is always a possibility that financial support might be provided for specific projects. On this point it is well to remember that most of the federal departments involved in emergency planning are not able to make benevolent grants in general support of a research area. They are however able to enter into specific research contracts in which finite objectives are defined and the work is quite definitely applied research. In a few instances a somewhat more general contract might be negotiated to explore a particular area in which there is a serious lack of knowledge. With these points in mind it can be seen that researchers seeking financial support should be specific and definitive in outlining any proposal.

Further information and advice on all aspects of research for emergency planning may always be obtained from Canada EMO, 400 Laurier Avenue West, Ottawa 4.

A handwritten signature in dark ink, appearing to read 'A.F.B. Stannard'.

A.F.B. Stannard,
(Scientific Adviser),
Canada Emergency Measures Organization.

SUBJECTS OF RESEARCH AND DEVELOPMENT INTEREST IN EMERGENCY PLANNINGMEDICINE & PHYSIOLOGY

- (1) The physiological effects of ionizing radiation including injury recovery mechanisms.
- (2) Epidemiology in emergency environments (natural disasters and war).
- (3) The development of mass immunization techniques.
- (4) Methods for the rapid assessment of casualties in severely damaged areas (natural disasters and war).
- (5) Studies of minimum levels of austere medical care.

CHEMISTRY & BIOLOGY

- (6) The development of emergency food sources and domestic substitutes for imported basic foods.
- (7) The production of balanced protein foods from new sources.
- (8) Methods for increasing the yield of protein food from ocean sources.
- (9) Methods for increasing the harvesting efficiency of ocean food resources.
- (10) Fish pond culture.
- (11) Algal and microbial food culture.
- (12) Synthesis of low cost food supplements.
- (13) Long term storability of foods.
- (14) Sensitivity of plant and animal life forms to radiation following a t to the minus 1.2 decay curve.
- (15) The behaviour of radioactive substances in soil exchange systems and fixation processes.
- (16) The assimilation of radioactive substances by aquatic organisms and ultimate effects.
- (17) Studies and applications of primitive decontamination techniques.
- (18) Removal of soluble isotopes from water.
- (19) Internal combustion engine fuel substitutes.
- (20) Methods for increasing the shelf life of pharmaceuticals.

PSYCHOLOGY & SOCIOLOGY

- (21) Studies of social systems under stress.
- (22) Individual and group effects of recurrent and extended periods of international tension.
- (23) Individual and group effects of natural disasters and extreme emergency environments.

ANNEX "B"

- (24) Studies of persuasion and attitude change.
- (25) The effectiveness of preconditioning for disaster (including planning, training and exercises).
- (26) Public attitudes towards emergency planning.
- (27) Public attitudes towards compulsory direction and control.
- (28) Human response to warning.
- (29) The effects on students and workers of a windowless environment.
- (30) Adaptation and sensitization to emergencies.
- (31) Problems in confinement under extreme crowding.
- (32) The translation of attitudes into action.
- (33) Public information requirements in an emergency environment.

ECONOMICS

- (34) Economic effects of a nuclear war.
- (35) Economic effects of major natural disasters.
- (36) Emergency measures of economic control.
- (37) The effects of a major war on domestic transportation systems.
- (38) The vulnerability of Canadian distribution systems for essential commodities.
- (39) The stability of the monetary system in the environment following a major nuclear attack.
- (40) The determination of critical civilian occupations in wartime environments.
- (41) The development of manpower inventories.
- (42) The analysis of inter-dependencies between essential sectors of the economy.
- (43) The economic effects of regional isolation and the capabilities for regional self-sufficiency.

METEOROLOGY, GEOGRAPHY & GEOPHYSICS

- (44) Studies of air pollution (general).
- (45) Nuclear cloud trajectory forecasting.
- (46) Heavy particle dry fallout.
- (47) Precipitation scavenging.
- (48) Natural processes of exchange and decontamination:
 - a. Transfer mechanisms from the stratosphere to the troposphere.
 - b. Transfer mechanisms in the surface boundary layer.
 - c. Transfer mechanisms at the earth-atmosphere interface.

- (49) Meteorological effects in shock and blast wave propagation.
- (50) Earthquake energy transfer mechanisms.
- (51) Studies of natural and man-made hazards to life and property.

PHYSICS & ENGINEERING

- (52) The reaction of structures and structural components (including electric power and telecom transmission equipment) to dynamic loading.
- (53) The effects of high energy radiation on electronic systems and components.
- (54) The behaviour of soils under dynamic loading.
- (55) Fire protection (general).
- (56) Storable and inert fire extinguishing materials (including powders).
- (57) Methods of extinguishing small fires.
- (58) Methods of protection against intense thermal radiation.
- (59) Shielding against nuclear radiation - including makeshift methods.
- (60) Instrumentation techniques related to nuclear weapon effects.
- (61) Decontamination techniques for radioactive contaminants.
- (62) Air filtration - including makeshift methods.
- (63) Methods of providing group austere accommodation in climatic extremes.
- (64) Emergency sewage disposal methods.
- (65) Emergency power sources including rechargeable devices.
- (66) Collapsible containers for bulk liquid storage.
- (67) The adaptation of photo-interpretive techniques to urban damage assessment.
- (68) Aerial monitoring of ground level radiation intensities.
- (69) Location of living persons trapped in debris.

ANNEX "C"RESEARCH PROGRAM CANADA EMOPROTECTION DIVISION

Comments related to Part II of the Senate Committee guideline is as follows:

- II. 2.4 (a) Distribution of agency spending.
- Ontario - \$125,000 p.a.
 - Quebec - 25,000 p.a.
 - Alberta - 25,000 p.a. + \$35,000 this fiscal year only (Suffield Trial)
- (b) Funding is according to institution interest and competence in specific EMO engineering problems.
- (c) Nil.
- (d) Nil.
- (e) Contract research is most profitable at Institutions where a competence and interest in the problem exists or can be developed. This is the only criteria for distribution currently used.
- 2.5 Personnel associated with scientific activities:
- (a) One Engineer, Two Technicians.
 - (b) One Engineer.
 - (c) Bachelor Level One.
 - (i) Canada
 - (ii) Canada
 - (iii) Canada
 - (iv) 8 years of which 2 years were in EMO
 - (v) 31 years
 - (vi) Nil
 - (d) 62-68 - One 1½ Engineers (Bachelor Level)
 - (e) 0% turnover 62-67
 - (f) 100% worked in industry
0% worked in universities
incumbent worked for Province of Ontario.
previous worked for DPW
 - (g) - 0 -
 - (h) Summer Students.

62-	65-
63-	66-
64-	67-
- 2.6 (a)
- (i) 20,000 p.a.
 - (ii) Nil
 - (iii) Nil
 - (iv) Nil
 - (v) Nil
 - (vi) \$190,000 this year and following; \$140,000 p.a. previously
 - (vii) Nil except that in (6) support is given to graduate students on project.
- 2.6 (a) Engineering and technology.

2.6 (a) (iii) War and Defence \$60,000 p.a.

(v) Construction - Note that this expenditure is to reduce vulnerability of peacetime construction to effects of war.

\$150,000 this year - \$100,000 other years.

2.6 (b) Capital fund is \$75,000 p.a. balance operating.

2.6 (c) \$100/y - 64-65 to 67-68

2.8.1. Two patents are pending - (1) beadblast valve
(2) fibre-glass blast door

No licences, no production except for items used in testing.

2.8.2. Journal articles - about 10

2.8.3. Reports from agency and units 3 published 10 in process of publication.

2.8.4. Nil.

2.8.5. Use of STIC - Canada EMO.

2.8.6. None - duration of program too short as yet.

2.8.7. Nil.

2.8.8. A semi-automatic spot welder to build models of reinforcing steel cages, has been developed.

2.8.9. Funding of dynamic simulator at MacMaster and encouragement of simulator construction at University of Calgary. Use of simulators on other projects will allow previously impossible work to be done in Canada.

2.9.1. PROJECTS

Blast Protection Program

(See attached list of projects)

Vulnerability Reduction Program

(See attached list of projects)

2.9.2. Since the Programs are young, no project is fully complete. The Mark I Shelter became the Mark II and will not be finished until 1970. The Blast Valve will be complete in six months.

ANNEX "C"BLAST

1. Development, design and testing of family blast shelters and specialized components
 - a. Development of MK I fibreglass blast shelter.
 - b. Development of MK II fibreglass blast shelter.
 - c. Development of FRP hatch covers.
 - d. Development of interference blast valves (family shelter size).
 - e. Development and testing of shock mounted furniture for family shelters.
 - f. Development and testing of FRP membrane blast door.
 - g. Analysis of dynamic response of thin rectangular plates in the membrane range.
 - h. Basic research of soil structure interaction.
 - i. Water recovery from internal combustion engines.
 - j. Cost-effectiveness analysis of protective systems for family shelters.
 - k. Publication of papers, and lectures to disseminate the information.
2. Comparative evaluation of structural systems for dual-purpose community facilities designed to act as blast shelters
 - a. Comparative structural analyses of different systems.
 - b. Comparative cost-effectiveness analyses of structural systems.
 - c. Detailed theoretical analysis of the selected optimum system.
 - d. Perspex model study to determine validity of theoretical study in elastic range.
 - e. Development of fabricating techniques for small concrete structures.
 - f. Evaluation, by static test on concrete model, of the validity of theoretical analysis.
 - g. Dynamic tests of concrete models.
 - h. Prototype study of optimum systems.
 - i. Publication of engineering and cost data.
3. Development and testing of methods to enhance the blast resistance of existing buildings or parts of buildings, to protect their occupants against blast and associated effects
 - a. Development and testing of large capacity blast valves.
 - b. Development and testing of hardware and systems for large-size blast doors.

- c. Development and testing of methods to enhance the strength of existing columns.
 - d. Development and testing of methods of increasing the ductility of existing joints.
 - e. Development and testing of methods for increasing the strength of existing floor systems.
 - f. A cost-effectiveness study to determine the relative effectiveness of different methods of strength enhancement.
4. Preparation of cost analyses for all the above to provide the necessary basis for the formulation of a blast protection policy
- a. Comparative cost studies of family shelters and public shelters.
 - b. Comparative cost studies of dual-purpose fallout protection with blast protection.
 - c. Comparative cost studies of protection in existing buildings against either form of new construction.
 - d. Detailed analyses of entire program in relation to existing risk of blast effect.

VULNERABILITY REDUCTION

Studying the response of structures and services to the direct effects of nuclear weapons and other dynamic loads.

- 1. Investigation of typical building components
 - a. Investigating the behaviour of steel columns under blast.
 - b. Investigating the characteristics of bolted steel connections.
 - c. Investigating the characteristics of welded steel connections.
 - d. Investigating the ultimate strength of at or below grade concrete structures.
- 2. Studies of the dynamic response and ultimate lateral strength of typical buildings
 - a. Investigating the behaviour of multi-storey steel buildings with semi-rigid connections and composite floor systems.
 - b. Investigating the behaviour of steel framed buildings with welded connections.
 - c. Investigating the behaviour of reinforced concrete shear wall buildings.
 - d. Investigating the blast resistance of earthquake resistant and non-earthquake resistant reinforced concrete buildings.

3. Studies on new construction materials
 - a. Investigating the use of foam concrete as an energy absorbing backfill material.
 - b. Investigating the use of foam concrete as a construction material.
 - c. Investigating the increased ductility of concrete by means of fibrous reinforcement.
4. Studies of laboratory dynamic loading systems
 - a. Feasibility study of multi-degree of freedom vibration system.
5. Developing methods for assessing the vulnerability of Canada to the direct effects of nuclear weapons and other dynamic loads
 - a. Buildings
 - (1) Developing a classification system for the vulnerability of typical buildings to dynamic loads.
 - (2) Preparing a suitable manual or manuals to carry out a survey based on this classification system.
 - (3) Training inspectors in the methods required for the survey.
 - b. Essential services
 - (1) Developing a classification system for the vulnerability of utilities such as sewer, water, electric power, gas, etc., to blast and other dynamic loads.
 - (2) Preparing a suitable manual or manuals to carry out a survey based on this classification system.
 - (3) Training inspectors in the methods required for the survey.
 - c. The statistical study of energy released by earthquakes in Canada
 - (1) An analysis of the earthquake history of Canada.
 - (2) Developing a planning system based on rational assumptions of an acceptability of risk.
 - (3) Predicting extreme value probabilities for earthquakes at different forecasting periods.
 - d. Provision of data on which a rational system of damage prediction may be based
 - (1) Collecting, analysing and publishing of data from the vulnerability surveys.
 - (2) Publishing data regarding the risk of earthquakes and other peacetime disasters.
 - (3) Preparing and publishing data regarding areas subjected to risk of blast.

RESEARCH PROGRAM CANADA EMOECONOMIC DIVISION

1. This refers to the letter from the Director of Research of the Committees Branch of the Senate to the Director General of August 12, 1968, and your request of August 23 for information on research by this Division, carried out since 1962, and to be carried out up to and including 1973.

2. The format used is that provided in the "Guide for Submission of Briefs" which was attached to the letter of August 12, and outlined in Part II 2, "Content of Submissions". Comments are as follows:

2.3 Personnel policies-

Because of severe shortage of economist positions on staff, much of research work has been carried out under contract, either with other federal departments and/or private consultants.

2.4 Distribution of activities -

In hiring consultants, close proximity to Ottawa is very desirable, to ensure coordination of detailed work. However field work for the urban analysis series of maps, carried out for Canada EMO by the then Department of Energy, Mines and Resources), was subcontracted out in the summers of 1963 to 1966 to geographers at local universities in the case of Vancouver, Toronto, Montreal, Hamilton and Windsor.

2.5 Personnel associated with scientific activities
(Economic Planning Division) -

- a. one economist (Division Chief);
- b. about 1/4 of economist's time devoted to non-research and administrative duties;
- c. the economist has a masters degree in economics, with most of the requirements for a Ph.D. completed;
 - (i) he was born in Canada;
 - (ii) he took his secondary education in Canada;
 - (iii) he did all his university work in Canada;
 - (iv) he has worked 13 years since graduation with his M.A.; he has worked with Canada EMO for 5 years;
 - (v) his age is 43;
 - (vi) he is able to operate effectively in English;
he is not bilingual, but has some capability of operating in French;

ANNEX "D"

- d. total number of professional staff in each degree category for each of the years 1962 to 1968 inclusive, and estimates for each of the years 1969 to 1973; and

- e. percentage of turnover;

<u>Year</u>	<u>B.A.</u>	<u>M.A.</u>	<u>Ph.D.</u>	<u>% Turnover</u>
1962	1	--	--	0
1963	1	1	--	0
1964	1	1	--	0
1965	1	1	--	0
1966	2	1	--	0
1967	1	1	--	0
1968	--	1	--	0
1969	--	1	--	0
1970	--	1	--	0
1971	--	1	--	0
1972	--	1	--	0
1973	--	1	--	0

- f. percentage of current professional personnel who, since graduation, have been employed by:
- (i) industry at one time - nil;
 - (ii) universities - nil;
 - (iii) provincial departments or agencies - nil;
 - (iv) other federal agencies - 100%;
- g. number of staff in each degree category on education leave - nil;
- h. number of university students given summer employment in the field of scientific activities for the year 1962 to 1968 are as follows:

<u>Year</u>	<u>Number of Students</u>
1963	11
1964	27
1965	11
1966	10
1967	7
1968	2

All were employed by those agencies to whom work was contracted out by Canada EMO, i.e., the Department of Energy, Mines and Resources and an Ottawa firm of economic consultants.

2.6 Expenditures associated with scientific activities

- (a) Total funds spent by agency on scientific activities broken down as in table (the scientific discipline is in all cases "economics" and the area of application is "war and defence");
- (b) operating funds are as shown in column 2 of table; this division made no capital expenditures:

ANNEX "D"

<u>Intramural R & D</u> (salaries within Canada EMO)	<u>Other</u> <u>Operating</u> <u>Funds</u> (mainly travel)	<u>R & D</u> <u>Carried</u> <u>out for</u> <u>Canada EMO</u> <u>by Private</u> <u>Firms</u>	<u>R & D</u> <u>Carried out</u> <u>by other</u> <u>Government</u> <u>Departments</u> <u>but Paid by</u> <u>Canada EMO</u>	<u>Data Collection</u> (carried out under contract with private firms)
1962-63 \$ 14,000	\$ 800	\$ --	\$ --	\$
1963-64 22,200	1,100	--	41,300	13,400
1964-65 23,500	1,500	--	53,400	9,000
1965-66 29,000	2,000	--	46,000	30,000
1966-67 30,000	2,000	17,500	56,500	34,200
1967-68 34,800	1,500	2,000	118,000	39,300
1968-69 19,000	1,000	15,000	30,000	45,000

- (c) Funds expended to further professional university education of staff for each of the fiscal years from 1962-63 to 1968-69 inclusive - nil.

2.7 Research Policiesa. Units concerned with intramural research activities

- (1) Programs and projects are selected, initiated and monitored through the Branch Director and through the Management Committee of Canada EMO. Other federal agencies which have an interest are fully consulted before and during each stage.
- (2) Priorities between programs and project are established as in (1) above, with costs and benefits being assessed as fully as possible.
- (3) CPN and PERT have not been used to plan and monitor research programs or projects, as time or cost choices have not been sufficiently complex. However the Economic Planning Division is aware of CPN and PERT and is prepared to make use of these. PERT has, nevertheless, been used to plan and monitor 16 operational projects and programs which are carried out by other departments but coordinated by the Economic Planning Division, in the course of a recent examination of the activities involved in civil emergency planning.
- (4) Because of staff shortages in the Economic Planning Division, all economic research projects which are unclassified from a security point of view have been contracted out;
 - (i) one project has involved the collecting of unclassified production, storage or other relevant quantitative data by a firm of economic consultants on various sectors of the Canadian economy on a "resource point" basis (i.e., each factory, grain elevator, mine, population centre, etc.), the locating of each point by map coordinates, and the listing and punching onto cards of the resultant data in a form which could be utilized for computer studies into the effects of nuclear attack on Canada's economy;

ANNEX "D"

- (ii) another project, which was contracted out to the Federal Government's Central Data Processing Service Bureau and largely sub-contracted out to U.S. and Canadian computer software firms, was the conversion of the complicated U.S. computer programs, which analyze effects of nuclear attack on resources, to run on the Central Data Processing Service Bureau's computer;
 - (iii) another study, contracted out to the Department of Energy, Mines and Resources and sub-contracted out to geographers at the Universities of British Columbia, Toronto, McMaster, Montreal and Windsor, involved the gathering, and in some cases, compiling and printing of urban characteristic data on Vancouver, Toronto, Hamilton, Montreal and Windsor.
 - (iv) another project, contracted out to a firm of economic consultants, was the appraisal of a U.S. dynamic input-output model and a consideration of the feasibility of adapting this model for use in Canada.
- (5) There has been no funding of extramural research programs for the Economic Planning Division in universities and industry. Subjects in which we would like to see economic research carried out have been submitted to the Scientific Adviser and circulated by him to universities, but none have indicated interest in the economic subjects concerned.
- (6) Research resources are shifted from one program (possibly even terminating it) to a new program by re-allocating funds in the departmental estimates. Before such re-allocation is carried out, discussions take place with other interested federal departments or other parties. There are no particular difficulties involved in this process.
- b. Units exclusively concerned with extramural research activities

Not applicable.

2.8 Research Output

- (1) No patents arose from the research activities.
- (2) No books or journal articles arose from the research activities.
- (3) Reports issued:
 - (a) "The Parm System - An Appraisal; a Report Prepared for Canada Emergency Measures Organization", by D.W. Carr and S.J. May, March 1967;
 - (b) "Resources in Canada 48 Hours After a Hypothetical Nuclear Attack", Economic Planning Division, Canada EMO, November 1963;
 - (c) "The EMO Resource Data File", Economic Planning Division, Canada EMO, May 1965;
 - (d) other reports and papers classified as Secret.

ANNEX "D"

- (4) (a) The annual Map Users' Conferences held by the Department of Energy, Mines and Resources have disseminated information to extramural groups on the urban characteristics series of maps, prepared for Canada EMO.
 - (b) An exposition of the coding system for aggregating resource data on a metropolitan area, county or census division, emergency government zone, province and Canada-wide basis was made to the interdepartmental Subcommittee on System for Standard Statistical Areas in September 1965.
 - (c) Interdepartmental working groups and committees of interested persons with a need-to-know have been used to disseminate information which is classified from a security point of view.
- (5) Interdepartmental working groups and committees have been used to transfer scientific and technological data obtained from outside Canada by the Economic Planning Division. The majority of such data is classified from a security point of view.
 - (6) The two individuals, who have been trained in a quantitative approach to economic analysis by use of computers and who have since left the Economic Planning Division of Canada EMO, are making use of the techniques learned while at Canada EMO in their present employment in other Federal Government Departments. They are not known to have made important contributions in their new fields as yet.
 - (7) The individuals concerned have made up small research teams with unique and valued abilities in the field of analysis of economic problems likely to occur in the case of nuclear attack on Canada.
 - (8) Unique or valuable research tools, facilities or processes added or developed during the period concerned include the following:
 - (a) analysis of urban characteristics of the metropolitan areas of Vancouver and Toronto by a series of 32 maps of the former and 42 maps of the latter, as well as data in manuscript form for Montreal, Hamilton, Ottawa and Windsor, done for Canada EMO by the Department of Energy, Mines and Resources;
 - (b) conversion of complex U.S. computer programs, which analyze effects of nuclear attack on an economy, to run on a Canadian computer.
 - (9) Impact of scientific activities and research output on the advancement of scientific knowledge and Canadian economic development in peacetime has been, in the case of 8 (a) above, to advance the frontier of urban economic geography studies. In the case of 8 (b) above, the impact has been that of the introduction into Canada of the most sophisticated computer system now being run by the Federal Government's Central Data Processing Service Bureau (according to the Bureau's Acting Director) and one of the most sophisticated being run in Canada as a whole. However the impact in wartime of the Division's scientific activities and research output would be much more far-reaching. The research carried out by the Division could, if acted upon through Government policy, have wide-ranging effects on the survivability of the Canadian economy and population in the event of major warfare which this country might be involved.

ANNEX "D"

- (10) Other measures or indications of research output - It might be mentioned that a considerable amount of know-how is being accumulated in Canada towards a capability of assessing, with a good degree of accuracy, the effects of major warfare, especially nuclear warfare, on the Canadian economy. By keeping up on U.S. technology in this regard, adapting it to suit Canadian conditions, and applying a relatively small amount of research particular to Canada, a capability has been built up in Canada to analyze quantitatively the effects of such warfare which is second only to that of the United States, at least in the Western world.

2.9 Projects

- (1) Titles or other brief descriptions of projects conducted during each of the years from 1963 to 1967, with indication and description of program of which they are a part:

N.B. All projects mentioned are part of the economic planning program which is designed to study the probable effects of nuclear warfare on the Canadian economy, including population, and to recommend measures to lessen such effects.

FY 1962-63

- Planning commenced on
- a. Urban Characteristics map project, and
 - b. the assembly of data on resource points throughout Canada for computer analysis.

FY 1963-64

- a. Field work and much of compilation for Urban Characteristics map project for Vancouver completed;
- b. Canada-wide resource data processed as computer input for the following categories - coal mines, minerals and mineral products, petroleum and natural gas, 1961 population of Canada, land by land use, farms by type of farming, professional personnel of Department of Agriculture.

FY 1964-65

- a. Field work and much of compilation for Urban Characteristics map project for Toronto completed. Compilation and drafting of Vancouver maps completed.
- b. Canada-wide resource data processed as computer input for the following categories - livestock on farms, artificial insemination centres, food processing and storage, inland waterways, terminal and mill grain elevators, airports by runway length.
- c. Interdepartmental study completed on the effects of nuclear warfare on a number of resource categories, down to a provincial and emergency government zone level.

ANNEX "D"FY 1965-66

- a. Field work and some compilation for Urban Characteristics map project for Windsor and Ottawa completed. Twenty-nine out of 32 maps for Vancouver printed.
- b. Canada-wide resource data processed as computer input for the following categories - clothing and textiles, electric generating stations, port facilities, coke, iron and steel plants, airports by geographic areas.

FY 1966-67

- a. Field work for Urban Characteristics map project for Hamilton completed. Compilation and drafting of Toronto maps completed. Printing of three remaining maps of Vancouver completed.
- b. Canada-wide resource data processed as computer input for the following categories field crops, vegetable and fruit crops, branches of chartered banks, agencies of the Bank of Canada, branches of the Industrial Development Bank, hospitals and nursing homes, civil air navigation aids.
- c. Study made, using computer methods, of the effects on the Canadian economy of
 - (i) a nuclear attack directed at U.S. military targets, but with fallout effects on Canada,
 - (ii) a nuclear attack, involving a number of weapons on Canada. Probability study on the survivability of the Canadian economy under nuclear warfare commenced.
- d. Examination of complex U.S. PARM dynamic input-output system carried out, and assessment made of its adaptability to Canada to analyze both a post-attack economy and the present peacetime economy.

FY 1967-68

- a. Field work and compilation for Urban Characteristics map project for Montreal completed. Printing of 42 Toronto maps completed.
- b. Canada-wide resource data processed as computer input for the following categories - country grain elevators, 1966 population of Canada, municipal water supply systems, refractory plants. Work commenced on data for fish processing plants and road transport resources.
- c. Computer analysis carried out on the effects of nuclear attack on several Canadian resource categories, particularly population and hospital facilities.
- d. Conversion of U.S. computer programs, for analysis of effects of nuclear attack on resources, commenced and largely completed.
- e. Analysis of effects of potential flooding on resources in the Fraser River Valley completed.

ANNEX "D"

- f. Analysis of the effects on Canada's Gross National Product producing potential of a nuclear attack, and benefit-cost study of economic planning program based on this analysis.
- g. Analysis, using PERT, of the 16 activities of a largely economic nature which contribute towards Canada's civil emergency planning objective.

FY 1968-69 (to date)

- a. Urban Characteristics Analysis mapping project terminated because of shortage of funds. Arrangements made with the Department of Energy, Mines and Resources to transfer all unpublished map manuscripts to Public Archives.
 - b. Canada-wide resource data processed as computer input for the following categories - municipal sewer systems and pulp and paper mills.
 - c. Benefit-cost study of the maintenance of a clothing stockpile in Canada for the eventuality of a major war was largely completed.
 - d. Conversion of U.S. Computer programs for analysis of effects of nuclear attack on resources tested out.
- (2) Case histories of the most significant completed projects of the last five years (basic research, applied research, or development):
- a. Primarily applied Research (with some basic research involved in each project)
 - (i) Interdepartmental Study of Effects of Nuclear Attack on Canada - 1964
This project was carried out as resource background for a national civil defence exercise. An interdepartmental working group was set up and departmental representatives analyzed attack effects on resources by non-computer means in their areas of responsibility, with breakdowns by the geographic-administrative regions of Canada. The resultant portions of narrative were collated and edited by the Economic Planning Division and were printed up as the first detailed, integrated examination of what the Canadian economy might be like after what might be a typical nuclear attack.
 - (ii) Compilation of Resource Data - 1963-68
This project involved the compilation of resource data on thirty categories of resources in a form which can be analyzed by a computer to assess likely nuclear attack effects on their productive capabilities. The project was largely carried out under contract with a firm of economic consultants, with cooperation in the searching out of suitable data being extended by several federal departments.

ANNEX "D"(iii) Computer Study of Effects on Canada of Nuclear Attack - 1966

This was a joint Canada-U.S. study of the effects of nuclear attack on the economies of the two nations. Two different types of attack were gamed in. The first type was an attack almost entirely on U.S. military targets; the second type was an attack on a balanced selection of military, population, industrial and government targets. An overall write-up for the two types of attack was completed, but a detailed write-up took place only for the attack on military targets.

(iv) Urban Characteristics Project - 1963-68

This project, carried out by the Department of Energy, Mines and Resources for Canada EMO, analyzed metropolitan areas by a series of maps, each map considering the area from the point of view of a single characteristic, e.g., building heights, structure of building, land use, port facilities, food processing plants, etc. Thirty-two maps were published for Vancouver and 42 for Toronto, with data for Ottawa, Windsor, Hamilton and Montreal reaching only the manuscript stage before the project had to be abandoned for lack of funds. The maps were specifically for use in civil emergency planning and operations, and were to have been completed for the sixteen areas thought to constitute the most likely targets in Canada in 1963. However, the maps attracted interest far beyond the field of civil emergency planners, particularly among those interested in urban studies.

(v) Analysis of Probable Effects of Nuclear Warfare on Canada's Potential for Producing GNP - 1967

This project arose out of a need for a benefit-cost approach to economic planning. The cost of such planning was clear, but the benefits could not be assessed until some quantitative study could be completed of the effects, on Canada's ability to produce its Gross National Product, of a nuclear attack. This study was successfully concluded, based on previously completed studies of the probability of damage to various sectors of the Canadian economy.

b. Development(i) Conversion of U.S. Computer Programs - 1966-68

The computer programs concerned are very complex ones which gave the United States, alone in the Western World at least, the capability of swiftly analyzing, in great detail, the effects of any given hypothetical (or actual) nuclear attack on their economy by means of aggregating the effects on the individual resource locations within

ANNEX "D"

each resource category. Commercially unclassified resource data was processed and fed into the U.S. system in order to assess effects on the joint U.S.-Canadian economies. However by 1966 work began on converting the U.S. programs to run on the Central Data Processing Service Bureau's computer in Canada, in order to give Canada an independent analytical capability, and, in particular, to enable the processing of commercially confidential data. These programs are now converted, to the extent that results from the same input produce the same outputs in both countries.

(ii) Appraisal of PARM Dynamic Input-Output Model System - 1967

The PARM system enables the checking out of economic objectives as much as one year after a nuclear attack, to see if those objectives are feasible in view of damage done, either hypothetically or actually, by a nuclear attack. The PARM system is very sophisticated in comparison with the static input-output models much more generally used in Canada and elsewhere. PARM was subjected to critical examination by a group of mathematical economists employed under contract by Canada EMO and recommendations regarding its adaptability were made in a 99-page appraisal.

ANNEX "E"

CANADA EMO RESEARCH CONTINGENCY FUND

PROPOSALS AND ACTIONS

SOURCE	RESEARCHER	SPONSORING OR INTERESTED AGENCIES	RESEARCH PROPOSAL	ACTION	DATE
McGill Univ.	Dr. McCutcheon	Canada EMO Public Works	Reaction of underground structures to blast	Funded \$7,500. Sponsored by EMO	1964
McGill Univ.	Dr. Gersovitz	Canada EMO Public Works	Structural Models	Funded \$4,500. Sponsored by EMO	1965
University of Alberta	Dr. Panar	Canada EMO	Recovery of water from engine exhaust	Funded \$2,700. Sponsored by EMO	1965
Univ. of Saskatchewan	Mr. Decker	Canada EMO Public Works	Blast wave mechanics	Referred to DRB and funded by them at \$3,900.	1965
Laval University	Dr. Mehran	Fisheries	Zn 65 aquatic environments	Funded \$4,000. Sponsored by Fisheries	1966
Univ. of Waterloo	Dr. Sherbourne	Canada EMO Public Works	Blast door design	Funded \$3,450. Sponsored by EMO	1966
Univ. of Toronto	Dr. Burton	Canada EMO EHS & EWS	National hazards	Funded \$14,000. Sponsored by EMO	1967
Univ. of Toronto	Dr. Hewitt	Canada EMO EHS & EWS	Man-made hazards	Funded \$3,500. Sponsored by EMO	1967
Research Triangle Institute	Mr. Brooks	Canada EMO	Analytical study of zone concept	Funded \$23,000. Sponsored by EMO	1967
Univ. of Alberta	Dr. Royal	Canada EMO EHS	Radiation physiology	Not supported	1965
Univ. of Saskatchewan	Dr. Lee	Dept. of Agriculture	SR 90 in soils	Under consideration but delayed	1965
Univ. of Saskatchewan	Dr. Rennie	Dept. of Agriculture	Cs 137 in soils	Under consideration but delayed	1965
Perdue University	Dr. Devenny	Public Works Canada EMO	Shock characteristics of soils	Funded \$10,000. Sponsored by Public Works	1967
Mount Allison Univ.	Dr. Chandra	Dept. of Agriculture	Radiation microbiology (soils)	Under consideration but delayed	1965
Univ. of British Columbia	Dr. Tregunna	Agriculture Forestry	Photosensitivity of plants	Referred through OEP to AEC in the United States	1964
Univ. of Saskatchewan	Prof. Gibson	EHS EWS	Recovery of protein	Funded \$7,550. Sponsored by Agriculture	1967
MacDonald College	Prof. MacFarlane	Department of Agriculture EHSB Agriculture	Regional self-sufficiency (food)	Under consideration	1967

ANNEX "F"LIST OF STUDIES IDENTIFIED IN PROJECT PHOENIXPublic Protection Sub-Program

1. Continuing study of the potential threat from nuclear, biological and chemical weapons.
2. Annual review of scientific and technological developments which have either an offensive or defensive potential.
3. Continuing study of potential defensive measures against all known or potential enemy weapons.
4. Studies to relate the methods of detecting, measuring and recognizing the potential hazards of various enemy weapons to appropriate protective measures.
5. Studies to determine the optimum combination of self-help, shelter and dispersal to produce the maximum saving of lives at the most economical rate; and to relate this to the most effective hazard monitoring and associated public control systems.
6. Studies to determine the best methods of managing and evaluating the effectiveness of such systems.
7. The maximum degree of protection that it is possible to achieve by individual and family protective measures. How far is community and/or local government assistance necessary to achieve this level? How can agencies in being assist? How much can be achieved in a period of strategic warning? And what would this imply?
8. All aspects of dispersal, including:
 - a. likely public reactions;
 - b. feasibility;
 - c. problems associated with dispersing various categories of the labour force;
 - d. implications of industrial dispersal;
 - e. effects on national economy;
 - f. options and possible phasing of dispersal during a period of strategic warning.

Public Information Sub-Program

9. Technical studies to develop best low cost means of communicating tactical warning to the public.
10. Studies to reveal the extent to which education of the public, relative to the hazards of war and to the appropriate protective

measures, is a factor in reducing casualties.

11. Studies of public reaction to official guidance at times of crisis, and of the best means of accelerating and intensifying the flow of public information during an emergency.

Essential Societal Services Sub-Program

12. A study to determine what parts of the educational system are critical and vulnerable and, therefore, require special attention in the development of emergency plans; and to indicate what those plans should incorporate with respect to educational systems.

Continuity of Government Sub-Program

13. The problems of reaching maximum possible national readiness under varying conditions including:
 - a. the public and key officials have not been fully educated in their emergency roles;
 - b. the public have been well educated, and key officials well trained in their emergency roles;
 - c. strategic warning is received and acted upon;
 - d. no strategic warning is received;
 - e. varying Canadian climatic conditions.
14. The full implications of what will be required of government at all levels during an emergency; and of the support and input which governments will require from their own agencies and from organizations in the private sector.
15. A study to indicate which Emergency Operating Centres must be completed with respect to structure, facilities and equipment in peacetime, and those which can be brought to a required state of readiness during a period of strategic warning.
16. Further study of the possibilities of introducing duality of purpose into the designs and potential uses of Emergency Operating Centres.
17. A review and study of all international agreements which have a bearing on the planning and implementation of civil emergency measures.
18. The nature and scope of all government operations from the beginning to the end of the emergency.

ANNEX "F"

19. The likely impact of various controls on the public and on organizations in the private sector.

Essential Utilities and Special Services Sub-Program

20. Studies of the vulnerability of all essential utilities to various weapon effects.
21. Studies of the problems in, and best methods of, restoring essential utility services by emergency substitution and/or repair.
22. The extent to which the vulnerability of essential utilities might be reduced in a period of strategic warning by carrying out appropriate and feasible measures.
23. A study to identify the criticality of essential utilities and services in terms of:
 - a. national requirements;
 - b. local requirements;
 - c. location relative to potential targets.
24. Studies and development to indicate practical and low-cost fire prevention measures.
25. Studies to determine how far fire prevention measures can be implemented during a period of warning; and their potential effectiveness.
26. Continuing study of the potential effectiveness of rescue operations with regard to increased enemy capability, in terms of attack pattern and weight of attack, and the increasing urbanization of Canada.

Economic Planning and Resource Control Sub-Program

27. Studies of the vulnerability to various weapon effects of key installations essential to the following activities:
 - a. energy and fuel
 - b. agriculture
 - c. fisheries
 - d. water
 - e. industry
 - f. food and feed production
28. The dependence of essential activities on money.

29. The methods of maintaining and/or improving agricultural yields under emergency conditions.
30. The methods of maintaining and/or improving the yield from fishing under emergency conditions.
31. The best methods of influencing production and applying controls in:
 - a. an accelerated state of emergency;
 - b. a period of strategic warning or slow escalation.
32. The effects of delay in imposing the necessary controls on essential resources
33. Water as a national resource, as an industrial requirement, as a utility and as an essential commodity for life, with a view to determining which of a number of authorities should be in a position to determine priorities and to impose controls in an emergency.
34. A study to determine if and where there are potential critical shortages of water during an emergency.
35. The effects and ramification, relative to the national economy, of regulating trade.
36. The best methods of regulating trade in:
 - a. an accelerated period of emergency;
 - b. a period of strategic warning or slow escalation.
37. The implications or potential implications on Canada's external trade pattern of a war emergency, and the identification of essential items the supply of which could become critical.
38. The entire field of industrial preparedness with a view to determining:
 - a. the benefits, if any, resulting from planning for the emergency on an industry basis rather than on a plant basis;
 - b. what advantages can be taken of a period of strategic warning.
39. A study, which is reviewed at regular intervals, to analyse the potential requirements of the nation in terms of commodities and essential materials throughout the emergency; and to identify those which could from time to time become critical.
40. Potential sources of supply of critical items among Canada's allies or other countries, relative to the potential war situation.

ANNEX "F"

41. A study to develop analytical procedures which will facilitate the making of sound and rapid decisions relative to the availability and allocation of essential national resources.
42. The potential food and feed situation with respect to:
 - a. seasonal variations
 - b. vulnerability
 - c. work force requirements and availability
 - d. the implications of war on the external trade pattern.
43. The relationship of the potential availability of food and feed to the dietetic and health requirements of:
 - a. humans
 - b. animals.

Service Activities

44. An analysis of the total communications requirements for civil emergency purposes.
45. Continuing study of the implications of new technology.
46. Studies of the vulnerability to various weapon effects of key installations and components of:
 - a. the communications systems
 - b. the transportation systems
 - c. the postal services.
47. The implications of new technology on the methods and evaluation of damage determination.
48. The basic requirements and progressive stages of damage determination.
49. A study to develop procedures for evaluating the vulnerability of systems and system components.
50. Transportation as a total system in an emergency, rather than four separate systems.
51. The most effective and economic means of developing within provinces an emergency capability which can be rapidly expanded during a warning period to assume control, if necessary, of all emergency activities.

Notice of Award

ANNEX "G"CANADA EMERGENCY MEASURES ORGANIZATION RESEARCH FELLOWSHIPS

FIELD OF
STUDY: Sociological effects of major disasters.

VALUE: \$5,000 (Can.) per annum for maximum of three years.

NUMBER: One, offered annually.

DURATION: To complete the graduate degree for which the award is made.

CONDITIONS: Preference will be given to Canadian residents who hold a Master's degree in Sociology. However Candidates with a first degree major in Sociology will also be considered.

WHERE
TENABLE: Disaster Research Centre, Ohio State University, Columbus, Ohio.

CLOSING
DATE: 31st. March.

FURTHER
INFORMATION: Director of Awards, AUCC
151 Slater St., Ottawa 4, Ontario.

APPENDIX 56

B R I E F

to

SPECIAL COMMITTEE ON SCIENCE POLICY

from

DOMINION COAL BOARD

Ottawa, Ontario

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SUMMARY AND RECOMMENDATIONS

The statutory functions of the Dominion Coal Board with respect to research and investigations are contained in Section 7 of the Dominion Coal Board Act, a copy of which is attached to this Brief.

In discharge of these functions, it has been Board's policy not to create its own laboratories but rather to make use of existing Federal facilities, thereby avoiding duplication. A second policy, which recognized the scarcity of coal-oriented research talent, has been to encourage the development of non-federal centers of knowledge in the provinces. When appropriate, assistance has been given to individual coal companies which exhibited sufficient interest and capacity to undertake meaningful study projects.

The Board's assistance has been on a modest scale, amounting in total to \$50,000 per year, distributed among approved recipients. In 1967-68, these numbered eight. In every case, the recipient contributed the major share of the cost of his study project. The Board's contribution has been in the nature of a catalyst to promote action rather than a principal source of funds. This co-operative approach has been found useful and an important factor in winning the necessary co-operation and interest has been the Board's practice of regularly obtaining the views of the Canadian Advisory Committee on Coal Research before deciding on the yearly allocation of its available funds.

To assist in the dissemination of knowledge related to coal, the Dominion Coal Board has organized and administered the Federal-Provincial Conferences on Coal. The 20th Conference was held in Quebec City in September, 1968.

In view of government's intent to dissolve the Dominion Coal Board, the latter will no longer be able to discharge the above functions but wishes to recommend that the Federal Government continue to pay adequate attention to coal research and development for the following reasons:

- (a) The associated industry is financially unable to support, by itself, a research and development program but can continue to participate in centrally administered programs by federal or provincial governments.
- (b) Fundamentally, research and development are of more significance to the state, with its longer-term need to meet its escalating energy and metallurgical demands, than it is to the current coal mining industry with its passing interests and problems.

Recommendations

Toward establishing in Canada a more constructive and perhaps more realistic attitude toward coal research and development, it is recommended that this be based on the concept of coal as a massively-present resource of large potential rather than on the concept of curing the problems of the industry as it now exists. It is believed that research people would welcome this longer-term and broader approach because it would allow more consistent planning of investigations and, in the process, help attract a larger number of qualified personnel on career basis.

It is further recommended that research and development for all our energy resources, including coal, be more closely co-ordinated. In the face of our rising energy demands, it appears advisable to adopt a total energy concept and to modify materially the present pattern of compartmented efforts among our several energy sources. A combining of research skills could prove beneficial in making best use of available personnel and could assist materially in promoting the orderly and optimum use of all energy resources.

The key organization in Canadian coal research is the Fuels Research Centre of the Department of Energy, Mines and Resources. It is recommended that this Centre be given continued strong support so that it can continue to act as the senior scientific body in Canada on matters related to coal and give leadership and co-ordination at national level to industrial and provincial investigations.

It is further recommended that support be continued and strengthened toward establishing co-operative studies with provincial institutions including the universities. These co-operative programs make excellent use of existing skills within the provinces that can be most effectively employed only within the context of broad programs. In the Board's experience, a modest outlay of funds is sufficient catalyst to promote useful studies. Further to such co-operative efforts, the above mentioned Fuels Research Centre could act as a Federal base for scientific control and co-ordination.

BRIEF TO SPECIAL COMMITTEE ON SCIENCE POLICY

by

Dominion Coal Board, Ottawa, Ontario

The following reply has been arranged in the order presented in Part II of "Guide for Submission of Briefs and Participation in Hearings".

2.1 Organization

(a) An organizational diagram of the Dominion Coal Board is attached.

(b) A block diagram is attached showing parliamentary reporting channels, connections with other Federal agencies, and advisory committees.

(c) This block diagram has not been prepared for the Dominion Coal Board because of the compact size of our organization. It is believed that diagrams provided under (a) and (b) above should be sufficient.

(d) The Dominion Coal Board has no formal agreements regarding scientific activities with organizations outside of Canada.

(e) A "nil" reply also because the Board has no overseas offices.

2.2 Organizational functions

(a) The statutory functions and powers of the Dominion Coal Board are precisely stated in Section 7 of the Dominion Coal Board Act, a copy of which is attached.

(b) It has been the policy of the Dominion Coal Board, from its inception, that it would not set up its own laboratories but rather to use and support existing laboratories engaged in coal research. A second over-all policy, which recognizes the scarcity of research relating to mining in general, is to encourage and promote the development of centres of knowledge on matters related to coal. These centres exist not only within the Federal Government but also within Provincial organizations such as research councils and in universities. When appropriate, assistance is also provided to individual coal mine operators who give evidence of interest and capacity to undertake development related to coal.

(c) With respect to the Board's functions and responsibilities relative to other Federal Agencies, the Board is required, under its Act, to advise on all matters related to coal. It has done so since its inception.

With respect to industry, a function of the Board is to determine areas of research and development that are important to the industry and which require promotion and support. This assistance is provided after consultation with the industry and normally is conducted in co-operation with the coal mining industry. It is also a Board function to help disseminate information by reports, by conferences, etc.

With respect to educational institutions it is, as indicated under (b) above, a continuing interest of the Board to develop, promote and support centres of knowledge on matters related to coal.

Regarding international representation and monitoring of outside scientific activities, the Board has kept in touch with coal research and development organizations in other countries. In addition, the Board attracts foreign authors to annually-held coal conferences supported by the Board.

The Board also carries certain responsibilities with respect to government agencies of coal producing provinces. For example, the Board advises such agencies on the operational problems and economic status of the mines within their provincial jurisdiction and also assists such provincial agencies in the initiation of technical/economic studies related to their coal mining industries.

All the above co-operative efforts are initiated and promoted by the Dominion Coal Board only after full consultation with the outside parties involved. For example, some of our responsibilities to other Federal agencies are conducted by means of the Interdepartmental Fuel Committee. Similarly, our contribution to other Federal agencies is conducted through Committee work such as the Interdepartmental Committee on Energy Statistics, the Canadian Government Specifications Board, etc. The Board's association with industry and educational institutions is promoted partly through the Canadian Advisory Committee on Coal Research. Essentially, the Board has found the committee approach to be a most useful method toward achieving our over-all aims.

(d) Effectiveness, duties and goals related to research and development are reviewed and revised (controlled) as follows:

- (1) All recipients of research funds from the Dominion Coal Board are required to submit each year a technical report on progress as well as a financial statement on expenditures made. From time to time, also, the Board seeks outside views, particularly those of the Canadian Advisory Committee on Coal Research, with respect to the acceptability of specific subject matters.

(e) An example of an outside study commissioned during the past five years was the one conducted in co-operation with the New Brunswick Department of Mines to determine the practical economical life of the Minto coal field in New Brunswick. This study was assigned by the Board to an outstanding mining expert, Mr. T.G. Gerow, whose report has subsequently been employed to excellent effect by the Province of New Brunswick in its rationalization program for that coal field.

(f) Although the Board has been reasonably effective in discharging its responsibilities with respect to research and development, it must be stated that these powers have not been fully exploited.

(g) The major hindrance to the effective discharge of responsibilities related to the promotion of research and development has been an erroneous but broadly held belief that coal has little place in the future energy requirements of Canada. This misconception is now being dissipated largely because of the growing realization of the importance of coal to our export trade and to our basic industries in the thermal-electric and metallurgical fields.

(h) A major change that is currently being considered for the Dominion Coal Board is its dissolution and absorption in an over-all energy organization of the Federal Government.

2.3 Personnel Policies

(a) Research workers are screened for effectiveness with the help of the Canadian Advisory Committee on Coal Research. This Committee is comprised of research workers (knowledgeable of coal) in Federal and Provincial government agencies.

(b) We have developed no unique criteria for identifying those of creative minds.

(c) As indicated, the Dominion Coal Board operates no laboratories of its own but supports those already established. Consequently, we have not taken direct steps toward identifying researchers of high potentiality as research administrators but we do take note of, and encourage, the outstanding individuals of co-operating research organizations. For example, people with promise in the Fuels Research Centre of the Mines Branch, Ottawa.

(d) For distinguishing between administrators and researchers, we follow practices established within the Federal Civil Service.

(e) We have not had to adopt such a policy for our own staff members.

2.4 Distribution of activities

(a) Although we adhere to no rigid pattern, nevertheless, our support research activities tends to be concentrated in coal producing provinces.

(b) We do not find that any region is more particularly suited for any given scientific activity than any other region.

(c) With respect to activities carried out to assist in specific regional phenomena, these are as follows:

- (1) The reduction of sulphur in Nova Scotia coals to make them more suitable for metallurgical purposes.
- (2) Improving the coking qualities of western metallurgical coals.
- (3) Promoting the use of lignite as a future Saskatchewan energy resource.

(d) The Board's role in contributing to regional development has been an indirect one through support and encouragement of a region's coal industry. For example, the Board took a leading part in developing the coal export trade to Japan which is very significantly adding to the economy of British Columbia and Alberta. The Board also provided much of the basic information required in the Federal planning that led to the formation of the Cape Breton Development Corporation.

(e) In the Board's experience there is a distinct benefit in a regional distribution of R & D studies. The principal benefit is that use can be made of provincial skills and facilities to supplement Federal strength during specific studies, thus avoiding a permanent addition to the Federal establishment.

A necessary condition for the success of regional and, indeed, of Ottawa based studies is that the Federal and Provincial governments, in association with industry, should be prepared to develop study results up to the stage of commercial application. This is a vital step in the completion of a project requiring business experience not normally possessed by research scientists.

2.5 Personnel associated with scientific activities

This query about personnel associated with scientific activities is not applicable to the Dominion Coal Board because, as indicated above, it has been the Board's policy and practice to utilize and support existing organizations.

2.6 Expenditures

Following is a tabulation of expenditures made on research and development during the period requested.

<u>Functions involved:</u>	Support of R & D in Industry, Universities, and Provincial Research agencies. The research is applied research.
<u>Scientific discipline:</u>	Engineering & Technology.
<u>Area of Application:</u>	Industry.

Table of Expenditures in Period Requested

Fiscal Year	R & D in Industry	R & D in Universities	R & D Provincial Agencies	R & D Other Federal Agencies	R & D within Board	Total
1962-63	-	-	-	-	-	-
1963-64	-	-	-	-	-	-
1964-65	-	-	-	-	-	-
1965-66	-	-	10,600	23,000	16,400	50,000
1966-67	\$6,500	2,700	10,500	22,000	8,300	50,000
1967-68	\$4,100	2,700	17,500	23,400	2,300	50,000
1968-69	-	-	-	30,000	-	30,000

Forecasting beyond 1968-69 is impossible because a probability exists that the Board may be dissolved.

No funds have been spent on furthering professional university education of staff.

2.7 Research Policies

(a - 1) Project proposals are invited by the Board from organizations and individuals engaged or interested in coal studies. These proposals are examined for suitability by the staff of the Board in co-operation with the Canadian Advisory Committee on Coal Research. This process results in a formal recommendation to the members of the Dominion Coal Board who have powers for accepting, rejecting or modifying proposals.

Following acceptance of a proposal, the approved funds are forwarded to the head of the organization concerned, not to the researcher himself. For example, funds are issued whenever possible to the chief treasury official of the organization concerned or, failing that, to the president or managing director of the organization.

The recipient of each grant is required to submit to the Board an annual report on technical progress and an annual statement of expenditures incurred. In addition, the researcher is required to re-apply each year for continuation of assistance even though he had received approval for the same subject during the preceding year.

An instruction booklet has been prepared for the advice of all applicants with respect to the conditions and limitations governing these grants. This booklet also contains a form for annual financial reporting to the Board. A copy is attached.

Money for grants is obtained through annual submission of a budgetary item by the Board.

(2) Priorities are established in co-operation with the Canadian Advisory Committee on Coal Research and in accordance with the instructions of the members of the Dominion Coal Board.

Fundamentally, priority is given to those study proposals which appear to offer earliest benefit in the utilization of Canada's coal resources. Consequently, there is a strong bias toward applied research. However, reasonable attention is paid to proposals of a basic research nature and, very approximately, about 10% of our efforts are directed toward such basic studies.

(3) Critical path techniques are not employed for monitoring programs because of the limited scope of our efforts and our firsthand contact with the individual study groups.

(4) As part of the Board's responsibilities to the coal mining industry of New Brunswick, a project was contracted out to Mr. T.G. Gerow, Consulting Engineer of Minneapolis, U.S.A. This contract called for a measurement of the reserves of the Minto coal field and a technical evaluation of the realistic future of the mining operations in that area.

(5) The policies behind Board funding of research in universities and industries are:

- (a) to promote research and development related to coal.
- (b) to utilize existing personnel and equipment wherever these exist in Canada.

We believe these policies to be in line with traditional Federal attitudes.

In addition, the Board is required to perform these functions by virtue of the requirements of its founding Act.

(6) Periodically, need has arisen in the past for changing, curtailing or eliminating certain study proposals. In such cases, the matter was discussed beforehand with the researcher concerned and also with the Canadian Advisory Committee on Coal Research. Our objective was to obtain a broad and informed consensus before taking action. Unilateral action by the Board itself has been avoided whenever possible.

(7) The results of investigations are transmitted directly to organizations and individuals we know to be interested in these results. Papers are also

published in technical journals and there are reports by Federal departments.

(b - 1 to b - 7) See note (2) above for methods of accepting and funding study projects, for monitoring programs and for dissemination of results.

(b - 8) 100 per cent.

(b - 9) On average, about 70% of the funds requested were ultimately granted in each of the years in which the Board has given such aid.

2.8 Research Output

(1) No patents have arisen.

(2) & (3) Approximately 15 reports have arisen from these study projects.

(4) A coal conference has been held in each of the years concerned, as well as an annual meeting of the Canadian Advisory Committee on Coal Research.

(5) The Board sponsors and administers the annual Dominion-Provincial Conference on Coal, to which foreign experts are invited as authors and as delegates. The prime objective of the conference is to disseminate information of Canadian and foreign origin.

(6) Nil report.

(7) We believe that our limited participation in funding research and development has assisted modestly in maintaining and enlarging teams that now make valuable contribution to coal knowledge.

(8) It is difficult and perhaps inappropriate to claim precise benefits or achievements that have arisen as a result of our partial financing of study projects.

(9) Same as for (8) above.

(10) An outside assessment of results of the Board's efforts is included in the report "Coal Research in Canada - 1967" by Dr. N. Berkowitz, Research Council of Alberta. This report deals with all coal research conducted in Canada. A copy is attached, with pertinent points related to the Board indicated for convenience.

2.9 Projects

(1) The following list of studies represents only those that were accepted by the Dominion Coal Board as warranting support. A number of others were not accepted usually on the grounds of duplicating similar work in other countries.

1964-65

Technical/Economic Evaluation of the Minto Coal Field, New Brunswick.

Conducted in co-operation with the Department of Mines of New Brunswick, the objective was to make a realistic estimate of the life remaining to this coal field. This estimate was based not only upon an independent study of the remaining coal reserves but also of the economic viability of the mining operations.

1965-66

Technical/Economic Evaluation of the Minto Coal Field, New Brunswick.

The study was completed this year and a report submitted to Provincial authorities with recommendations. These have been incorporated in a Provincial rationalization program for phasing out this coal field.

Reduction of sulphur and Ash in Canadian Coals.

This laboratory study is directed toward establishing new techniques for reducing deleterious sulphur and ash contents of Canadian coals to improve their acceptability for metallurgical and other industrial uses.

Techniques for Carbonizing Coal for Metallurgical Purposes.

This laboratory study has the objective of improving the carbonizing qualities of Canadian coals to upgrade their marketability in the steel making and other metallurgical industries.

1966-67

Coal as a Cleaning Medium for Industrial Waste Water.

A potentially large use for coal is as a cleaning medium for industrial wastes and sewage. These possibilities were studied in a Canadian university. An attractive factor is that coal, after being used for such purpose, can be recovered and used for steam raising purposes. This appears particularly attractive with respect to the pulp and paper industries which are substantial contributors to stream pollution as well as large users of fuel.

Reactions of Coal in Presence of Active Atomic Species.

In this study pulverized coal is reacted with atomic hydrogen and nitrogen to determine if chemical alteration occurs. This is part of an over-all study being conducted in the Research Council of Alberta into the structure and properties of coal that might lead to new processes for converting coal into chemicals and for new methods for coal gasification and hydrogenation.

Reduction of Sulphur and Ash in Canadian Coals.

(See above for 1965-66)

Lignite as Prime Energy Source for Saskatchewan Industrial Development.

In this study assistance was provided to the Saskatchewan Research Council as part of their over-all program for making optimum use of provincial resources. The study project comprised a technical/economic study to determine the feasibility of several alternatives involving the use of large quantities of lignite coal in a multi-purpose industrial complex which would combine the solution mining and refining of potash, the manufacture of ammonia, and the production of electricity. In this study an attractive factor is the very low cost of lignite as an energy source.

Upgrading the Metallurgical Quality of Nova Scotia Coal.

This study was contracted to a consulting firm of qualified metallurgists who operated in close co-operation with metallurgists of the Federal government. The study comprised the evaluation of the coals concerned and the determination of methods for upgrading them. The economic objective was to replace one-half million tons of imported coal with the native product. This volume of imported coal is now being consumed annually in the steel works at Sydney, N.S.

Improvement of Automation for Coal-Fired Boilers.

The objective of this study is to improve the automation involved in feeding coal to boilers. A serious disadvantage for coal is that much labour is involved in handling and this is a significant cost reason why oil and gas are displacing it in steam raising plants. Improvement in automation would substantially increase coal's competitiveness in this important market.

1967-68

The 1966-67 studies were continued throughout 1967-68.

1968-69

Reduction of Sulphur and Ash in Canadian Coals.

(See description above)

Improvement of Automation for Coal-Fired Boilers.

(See description above)

The studies in 1968-69 were curtailed in line with the over-all reduction in Federal spending.

(2) Case Histories: A completed and effective project was the determination of a realistic life for the coal mining operations of New Brunswick. This determination has allowed a rational program to be established for the phasing out of these publicly-supported operations. Earlier estimates had been unrealistically high, giving rise to undue optimism as to future possibilities and hindering a rational solution to a chronic industrial/social problem. Former studies had been devoted largely to geological factors only, but the latter study included the more significant parameters of operational costs, mining procedures, evaluation of possible improvements, as well as the employment factor and provincial responsibility. This study has formed a significant base for the current rationalization program of that coal field.

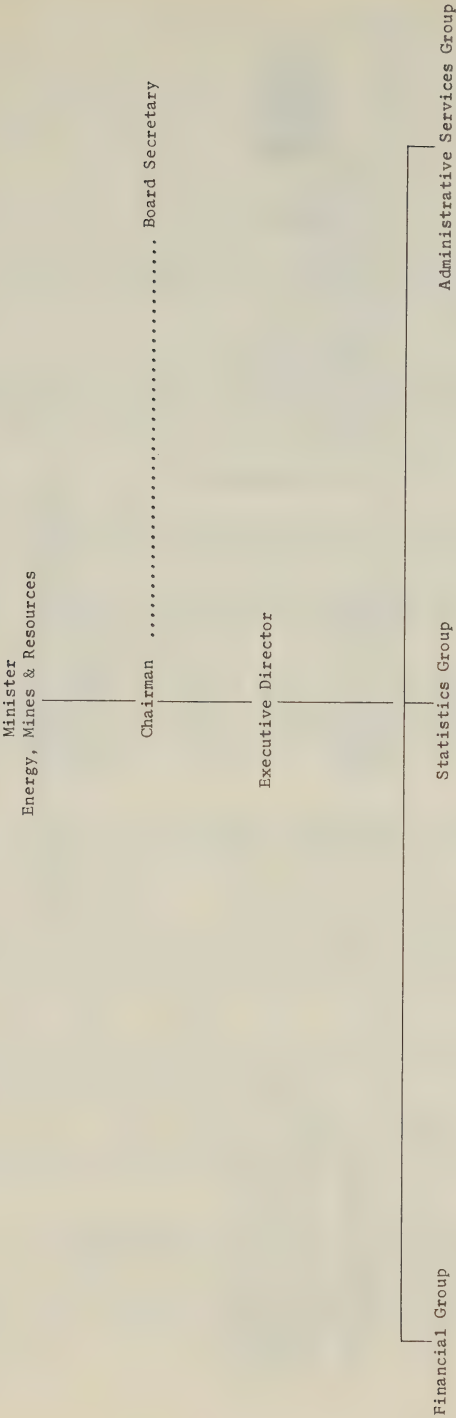
A second completed project was concerned with the upgrading of Nova Scotia coal to a metallurgical quality acceptable to the steel making industry of that province. The completed report, with recommendations, has been submitted to the

Special Committee

coal mining industry and steel company concerned. The first of the recommendations has been adopted, with acceptance of others awaiting industry's decision.

2.10 Organizations not currently engaged in scientific activities

Not applicable to Dominion Coal Board.



Dominion Coal Board
Present Organization Chart

Minister
Energy, Mines & Resources

Chairman & Members

Fuels Research Centre Energy, Mines & Resources	Executive Director Dominion Coal Board	Canadian Advisory Committee on Coal Research Nova Scotia Research Foundation Saskatchewan Research Council Research Council of Alberta Coal Producers - Canadian Coal Importers
Atlantic Development Board National Energy Board Department of Trade & Commerce Department of Industry Dominion Bureau of Statistics				

Dominion Coal Board

Parliamentary reporting channel and association
with other Federal agencies, committees, etc.



CHAPTER 86.

An Act to establish the Dominion Coal Board.

SHORT TITLE.

1. This Act may be cited as the *Dominion Coal Board* Short title.
Act. 1947, c. 57, s. 1.

INTERPRETATION.

2. In this Act, Definitions.
- (a) "Board" means the Dominion Coal Board established "Board."
by this Act;
- (b) "Chairman" means the Chairman of the Board; "Chairman."
- (c) "coal" includes coke, briquettes and all other pro- "Coal."
cessed forms of coal;
- (d) "member" means a member of the Board; "Member."
- (e) "Minister" means the Minister of Resources and "Minister."
Development. 1947, c. 57, s. 2; 1949 (2nd Sess.),
c. 18, s. 9.

3. (1) There is hereby constituted a body corporate, Corporation
established.
to be known as the Dominion Coal Board, for the purposes
set out in this Act.

(2) The Board is for all its purposes an agent of Her Agency of
Her Majesty.
Majesty, its powers may be exercised only as an agent of
Her Majesty, and it is responsible to and subject to the
direction of the Minister.

(3) The Board shall consist of not more than seven Members.
members appointed by the Governor in Council and who
shall hold office during pleasure.

(4) One of the members shall be appointed by the Chairman of
the Board.
Governor in Council to be the Chairman of the Board who
shall be paid such salary as the Governor in Council may
fix.

(5) The Chairman shall be the chief executive officer of Idem.
the Board, shall have supervision over and direction of the
work of the Board and of the officers, clerks and employees
appointed to carry on the business of the Board.

2 Chap. 86. *Dominion Coal Board.*

Remuneration. (6) Each member, other than the Chairman, shall be paid such remuneration for his services as the Governor in Council may fix and is entitled to be paid his travelling and other expenses in connection with the work of the Board.

Board to contract in name of Her Majesty. (7) The Board may on behalf of Her Majesty contract in the name of Her Majesty and property acquired by the Board is the property of Her Majesty and shall be vested in the name of Her Majesty.

In case of absence. (8) When any member by reason of any temporary incapacity is unable at any time to perform the duties of his office, the Governor in Council may appoint a temporary substitute member upon such terms and conditions as the Governor in Council may prescribe.

Quorum. (9) A majority of the members appointed constitutes a quorum.

Vacancy. (10) A vacancy in the Board does not impair the right of the remaining members to act.

Rules. (11) The Board may make rules for the regulation of its proceedings and the performance of its duties and functions under this Act.

Oath. (12) Before any member enters upon the execution of his duties, he shall take and subscribe, before the Clerk of the Privy Council, an oath, which shall be filed in the office of the said Clerk, in the following form:

I,, solemnly and sincerely swear that I will faithfully and honestly fulfil the duties which devolve upon me as a member of the Dominion Coal Board. So help me God.

Head office. (13) The head office of the Board shall be in the City of Ottawa, in the Province of Ontario, but meetings of the Board may be held at such other places as the Board may decide. 1947, c. 57, s. 3.

Officers, clerks and employees. 4. (1) Except as provided in subsection (2), the officers, clerks and employees necessary for the proper conduct of the business of the Board shall be appointed in the manner authorized by law.

Professional and technical advisers. (2) The Board may, with the approval of the Governor in Council, employ professional and technical advisers and assistants for temporary periods or for specific work and with such approval may fix the remuneration of the persons so employed.

Board to constitute a department of the Government. (3) The Board and all persons employed pursuant to this section constitute a department of the Government of Canada over which the Minister shall preside, and for the

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purposes

purposes of the *Civil Service Act* the Chairman is the deputy or deputy head of the department. 1947, c. 57, s. 4.

5. (1) Notwithstanding any other statute or law, where a person who is appointed a member of the Board was immediately prior to his appointment a contributor under the *Civil Service Superannuation Act*, he continues while he is a member of the Board to be a contributor under the *Civil Service Superannuation Act*. Contributors under Civil Service Superannuation Act.

(2) For the purposes of the *Civil Service Superannuation Act* the service of a member of the Board to whom subsection (1) applies, as a member of the Board, shall be counted as service in the civil service and he, his widow, children or other dependants, if any, or his legal representatives, may be granted the respective allowances or gratuities provided by the *Civil Service Superannuation Act*. Service as a member of the Board to be counted.

(3) The retirement of a member of the Board to whom subsection (1) applies upon expiration of his term of office shall, for the purposes of the *Civil Service Superannuation Act*, be deemed to be retirement by reason of abolition of office. 1947, c. 57, s. 5. Retirement.

6. The Board shall study, review and recommend to the Minister from time to time such policies and measures as it considers necessary respecting the production, importation, distribution and use of coal in Canada. 1947, c. 57, s. 6. Board to recommend policies.

7. The Board may undertake or cause to be undertaken researches and investigations with respect to: Powers of the Board.

- (a) the systems and methods of mining coal;
- (b) the problems and techniques of marketing and distributing coal;
- (c) the physical and chemical characteristics of coal produced in Canada with a view to developing new uses therefor;
- (d) the position of coal in relation to other forms of fuel or energy available for use in Canada;
- (e) the costs of production and distribution of coal and the accounting methods adopted or used by persons dealing in coal;
- (f) the co-ordination of the activities of Government Departments relating to coal; and
- (g) such other matters as the Minister may request or as the Board may deem necessary for carrying out any of the provisions or purposes of this Act. 1947, c. 57, s. 7.

Duties of
the Board.

8. The Board shall:

- (a) administer, in accordance with regulations of the Governor in Council, any subventions or subsidies relating to coal voted by Parliament;
- (b) exercise and perform on behalf of the Minister such powers, duties and functions of the Minister relating to coal as the Minister may require; and
- (c) exercise and perform any other powers, duties and functions conferred on or required to be performed by the Board by or pursuant to any other Act or order of the Governor in Council. 1947, c. 57, s. 8.

Powers, etc.,
of Dominion
Fuel Board
transferred.

9. (1) The powers, duties and functions of the Dominion Fuel Board, established by order of the Governor in Council made on the 25th day of November, 1922, are hereby transferred to the Dominion Coal Board.

Members of
the staff
transferred.

(2) Notwithstanding section 4, the Governor in Council may by order designate persons who, prior to the 25th day of October, 1947, were members of the staff of the Dominion Fuel Board, to be members of the staff of the Dominion Coal Board and upon such designation such members shall be deemed to have been transferred to the Dominion Coal Board at that date, but no person by reason only of such designation is eligible to be certified as permanent by the Civil Service Commission. 1947, c. 57, s. 9.

Advisory
committees.

10. (1) With the approval of the Minister, the Board may establish and appoint the members of such committee or committees as it deems advisable to confer with and advise the Board with respect to any matter within its jurisdiction.

Living and
travelling
expenses.

(2) No person appointed by the Board to serve on any committee is entitled to or shall receive any fee or reward for any service rendered in connection with the duties of the committee, but each such person is entitled to his reasonable living and travelling expenses while engaged on any such service in any place other than his ordinary place of residence.

Duties and
functions of
committees.

(3) The Board shall prescribe the duties and functions of each such committee and may make rules for the regulation of its proceedings. 1947, c. 57, s. 10.

Regulating
and con-
trolling
production,
distribution
and use
of fuel.

11. (1) Where the Governor in Council is of opinion that by reason of conditions or events within or outside of Canada there is or is likely to be a shortage of fuel in Canada of such dimensions or nature as to imperil the welfare or national life of Canada as a whole or so as to

concern Canada as a whole, he may do and authorize such acts and things and make such orders and regulations as he may deem necessary or advisable to conserve the available supply of fuel and to regulate and control its production, distribution and use.

(2) The issue of a proclamation of the Governor in Council declaring that a national fuel emergency exists in Canada is conclusive evidence that by reason of conditions or events within or outside of Canada there is or is likely to be a shortage of fuel in Canada of such dimensions or nature as to imperil the welfare or national life of Canada as a whole or so as to concern Canada as a whole, until by the issue of a further proclamation by the Governor in Council or by a joint resolution of the Senate and House of Commons it is declared that the national fuel emergency no longer exists in Canada. Fuel emergency.

(3) The Governor in Council may prescribe a fine not exceeding five thousand dollars or a term of imprisonment not exceeding five years or both fine and imprisonment as a penalty for violation of an order or regulation made under or pursuant to this section and may also prescribe whether, and the circumstances in which, the penalty shall be imposed upon summary conviction or upon conviction under indictment or upon either summary conviction or conviction under indictment, but in the case of summary conviction the term of imprisonment prescribed shall not exceed three months. Offences and penalties.

(4) Any goods, wares or merchandise dealt with contrary to any order or regulation made under or pursuant to this section may be seized and detained and are liable to forfeiture at the instance of the Minister of Justice, upon proceedings in the Exchequer Court of Canada, or in any superior court of a province, and any such court may make rules governing the procedure upon any proceedings taken before such court or judge thereof under this section. Goods, etc., may be seized and detained.

(5) In this section "fuel" includes coal, light and heavy fuel oil including bunker "C" fuel oil, kerosene, range oil, gas oil, diesel oil and any other hydro-carbon fuel used for the same purposes as the above designated grades. 1947, c. 57, s. 11. "Fuel."

12. Subject to the provisions of this Act, the Board is subject to the provisions of the *Financial Administration Act*. 1947, c. 57, s. 12. Board subject to Financial Administration Act.

13. All expenses under this Act shall be paid out of moneys appropriated by Parliament for the purpose. 1947, c. 57, s. 13. Payment of expenses.

6

Chap. 86.

Dominion Coal Board.

Receipts and
expenditures
to be
audited. **14.** All receipts and expenditures of the Board are subject to examination and audit by the Auditor General. 1947, c. 57, s. 14.

Annual
report.

15. The Board shall as soon as possible after the 31st day of March in each year and in any event within three months thereof submit to the Minister an annual report in such form as the Minister may prescribe of its affairs and operations during the twelve-month period ending on the 31st day of March, and the Minister shall lay the said report before Parliament forthwith if Parliament is then in session, or, if Parliament is not then in session, within the first fifteen days of the next ensuing session. 1947, c. 57, s. 15.

To be
laid before
Parliament.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1952

GRANTS IN AID
RESEARCH AND DEVELOPMENT RELATED TO COAL

DOMINION COAL BOARD
OTTAWA, ONTARIO

January, 1966

GRANTS IN AID
RESEARCH AND DEVELOPMENT RELATED TO COAL

DOMINION COAL BOARD
OTTAWA, ONTARIO

The Dominion Coal Board supports studies related to the production, marketing, transportation and utilization of coal by grants made available annually to Canadian institutions engaged in such studies or which are considered capable of undertaking effective work of this nature.

The Dominion Coal Board has enlisted the services of the Canadian Advisory Committee on Coal Research in examining and judging applications for grants. The decisions reached are influenced by three main factors:

1. the merits of the proposal;
2. the amount of funds available for making grants;
3. the capabilities of the institution.

GENERAL CONDITIONS

The following general conditions apply to grants made by the Dominion Coal Board in aid of coal research and development at Canadian institutions:

1. Grants are made subject to the annual appropriation of funds to the Dominion Coal Board by Parliament.
2. Grants are made only to applicants holding or otherwise enjoying the privileges of staff appointments in their institutions; the concurrence of the Executive Head of the applicant's institution is required in all cases; therefore if a grantee transfers from one institution to another, his grant at the first lapses and he must reapply in the normal way for continuation of support for his research.
3. Grants are not intended to cover the entire costs of the studies proposed; space and basic facilities at the institution of tenure are a pre-requisite to the award of a grant.
4. The amount of a grant provided is intended as a contribution toward the cost of a grantee's research program between April 1, and March 31; an unspent balance at March 31 does not lapse,* but remains available while the grantee remains at the same institution, for the original purpose of the grant or, with prior approval, for an alternative purpose.

* Except for coal research groups employed in the Federal Service.

5. The grantee (or the institution on his behalf) shall, if the need arises, immediately notify the Dominion Coal Board of an inability for any reason to carry out or complete the purpose for which a grant has been made.
6. Grant funds may be used for: the employment of assistants; the purchase of equipment, materials and supplies; certain travel; and activities undertaken to increase the institutions capabilities in coal research and/or development.
7. Grant funds must not be used for the remuneration of a grantee, his relatives or other staff members of his institution whose status would make them eligible for grants; the employment of all assistants under grants must be in accordance with normal policies of the institution; assistants paid from Dominion Coal Board grant funds are NOT Dominion Coal Board employees; salaries and wages paid to such assistants are subject to normal income tax and pension regulations for the category of employment, with the grantee (or his institution on his behalf) having the responsibilities of employer.
8. Title to equipment purchased under a grant remains with the institution at which the grant is held.
9. Grantees must make such reports of progress as the Dominion Coal Board may from time to time request.
10. The grantee and the institution in accepting a grant agree to follow the procedures established by the Dominion Coal Board for the administration of its grants.
11. In any publication arising out of investigations supported by Dominion Coal Board grants, acknowledgement of Dominion Coal Board assistance is requested.

APPLICATION FOR GRANTS

1. Applications for grants in aid should be made to the Chairman, Dominion Coal Board, Ottawa, not later than March 1. Appendix A is the form of application required.
2. Acknowledgement of Applications: The Dominion Coal Board acknowledges every application for a Grant. If an acknowledgement is not received within fifteen days of the date of submission of the application, the applicant should notify the Dominion Coal Board immediately.
3. Notification of Decisions: Successful applicants are sent official award letters informing them of the types and amounts of their grants immediately following their approval by the Dominion Coal Board and the Canadian Advisory Committee on Coal Research.

The Dominion Coal Board gives careful consideration to every application for a grant but reasons are not given for refusal to make a grant. Unsuccessful applicants are so advised immediately following consideration of their requests by the Dominion Coal Board and the Canadian Advisory Committee on Coal Research.

PAYMENTS OF GRANTS AND PROCEDURES
FOR THEIR ADMINISTRATION

Funds to cover the grants are sent to the institution business officer who will administer them through the business offices of the grantee's institution. Expenditures from each grant must be authorized by the grantee for the purposes described under "items of expenditures".

Disbursements for expenditures authorized by a grantee from a grant will be made by the institution business officer from the Grant Account.

At the close of each fiscal year (March 31) the Dominion Coal Board requires the submission of an annual statement of expenditures on the form provided, signed both by the grantee and the institution business officer. Grantee's statements of expenditures should be submitted to the Chairman, Dominion Coal Board, as soon as possible after March 31st each year and NOT LATER THAN APRIL 15TH.

In most institutions, the preparation of the expenditure statement is the responsibility of the business officer; grantees are asked to cooperate throughout the year in whatever manner is required to facilitate their preparation. Appendix B is the form to be employed when making the annual statement of expenditures to the Dominion Coal Board.

ITEMS OF EXPENDITURES

1. Employment of Assistants

Employees under grants in aid can normally be classified in one of the following two broad categories:

Category 1 - Individuals who participate in a grantee's research for the main purpose of obtaining research experience that will advance their knowledge and status as scientists, rather than for financial gain.

The Dominion Coal Board considers Category 1 to cover graduate students.

A graduate student is classified as an individual who works under the direction of an experienced investigator, and in collaboration with him, for the purpose of obtaining training and experience in research.

	Year of Graduate Study	
	<u>1st</u> \$	<u>2nd-3rd-4th</u> \$
Rate per month		
Academic Term (Oct-May)	162.50	212.50
Summer Term (June-Sept)	250.00	250.00

Category 2 - Individuals working mainly for normal salary, rather than for advanced training.

Employees in Category 2 consist mainly of technical and non-professional assistants. These are classified as individuals who are employed by grantees to do routine or semi-routine work associated with research projects, with varying degrees of supervision.

In this category, it is expected that employees under grants (other than short term casuals) will be employed in accordance with policies similar to those of the institution at which the grant is held, and that they will be paid in accordance with rates prevailing at the institution.

2. Equipment, Materials and Supplies

Grant funds may be used for the purchase of equipment, materials and supplies, etc., essential to the studies and not normally provided by the grantee's institution.

3. Travel for Field Trips

Grant funds may be used for travel for field trips essential to the study, without prior approval of the Dominion Coal Board.

4. Incidentals

Grantees may require funds for minor expenses other than those covered by (1), (2) and (3) above; such expenses should, where applicable, be listed under this heading in reasonable detail.

REPORTING ON RESEARCH

A brief progress report will be submitted to the Chairman, Dominion Coal Board with the statement of expenditures not later than APRIL 15TH. Expenditures to be reported in the form shown in Appendix B.

A full report of study projects supported by Dominion Coal Board grants will be submitted when the investigation has been completed.

APPENDIX "A"

To the Chairman, Dominion Coal Board, 140 Wellington Street, Ottawa.

APPLICATION FOR GRANT IN AID OF COAL RESEARCH AND DEVELOPMENT *

Date:.....

- 1. Name
Position
- 2. Department
- 3. Institution
- 4. Short title of proposed research
.....
.....
- 5. Briefly outline the proposed research, guided by the following headings: (i) background, (ii) capabilities, (iii) objectives, (iv) approach to be used, (v) estimated number of years to complete project:

* A separate application should be submitted for each proposed research project. If not sufficient space for 5, use reverse side.

6. Amount requested for fiscal year ending March 31, 196 for:

	<u>Number</u>	<u>\$</u>
(a) employment of assistants		
graduate students		
professionals		
others		
(b) equipment, materials, supplies, etc.		
(c) travel		
(d) other (specify)		
 TOTAL:		

Give particulars of Item 6 on reverse side

Special Committee

Particulars of 6 (a) (b) (c) and (d):

(a) assistants (name and previous associations)

(b) equipment and materials

(c) travel

(d) others

7. Give particulars of other applications for support of coal research and development or related fields from departments or other agencies of the government of Canada, or other organizations, for the current or coming year.

SIGNATURES OF:

Applicant

Head of Department

President or Principal

Special Committee

APPENDIX "B"

DOMINION COAL BOARD

GRANTS IN AID OF COAL RESEARCH AND DEVELOPMENT

GRANTEE'S STATEMENT OF EXPENDITURES

Year ending March 31, 196

GRANTEE

DATE

INSTITUTION

GRANT No.

GRANT TITLE

GRANTS

Unspent balance at close of previous year \$

Current year's grant

NET GRANT FUNDS AVAILABLE \$

EXPENDITURES

(1) Salaries \$
(show details on reverse side)

(2) Equipment, Materials, and Supplies

(3) Travel and Subsistence
(show details on reverse side)

(4) Other expenditures

TOTAL (not to exceed Net Grant Funds Available) \$

UNSPENT BALANCE OF GRANT AT CLOSE OF YEAR \$

INTENDED USE OF UNSPENT BALANCE

(Indicate by "X")

Is required for the purpose for which the grant was made.

Is not required for the purpose for which the grant was made, but a
proposal for its alternate use has been, or will be, submitted.

Is not required and should be refunded.

I hereby certify that the above statement is correct and that the expenditures
shown were for the purpose(s) for which the grant was made.

Grantee

I hereby certify that the expenditures summarized above were incurred wholly and
paid on behalf of the grantee, and that vouchers are available for audit purposes.

Business Officer

THE CANADIAN INSTITUTE OF MINING AND METALLURGY - 1898

COAL RESEARCH IN CANADA - 1967*

N. BERKOWITZ, Head, Coal Research Division,
Research Council of Alberta,
Edmonton, Alta.

* Contribution No. 415 from the Research Council of Alberta. Prepared on behalf of the Canadian Advisory Committee on Coal Research, this Review is one of a series which began to appear annually in the CIM Bulletin in 1964.

THE PAPER WAS SUBMITTED: on July 11, 1968.

KEYWORDS IN THIS PAPER: Carbonization, Petrography, Pollution, Desulphurization, Analysis, Storage, Solids Pipelining, Coal Research, Research.

(CIM) BULLETIN FOR AUGUST, 1968

ABSTRACT

Developing markets for western metallurgical coal have continued to stimulate considerable exploration activity in the Rocky Mountain foothills and to influence major segments of a wide-ranging carbonization R&D program. Adjunct studies have included expanded petrographic investigations.

Coal preparation has been principally directed toward utilization of prepared small coal and was, like much of the year's combustion work, strongly influenced by concern over atmospheric pollution. Particular attention has been given to desulphurization and to the suppression of pollutants in combustion systems.

In the area of non-fuel utilization of coal, interest has centered on plant nutrients and on a series of coal-based carbons which, inter alia, possess utility as filtration media.

Other projects included the development of improved sampling and analytical methods, investigations into the effect of storage on coal properties and R&D in solids pipelining. In addition, a significant volume of basic 'uncommitted' research has been maintained.

INTRODUCTION

With expenditures on coal R&D substantially unchanged from the 1966 level of approximately \$0.6 million, no major expansion of the over-all research effort has been possible. However, in response to industrial needs - largely defined by public concern over pollution and by developing overseas markets for Western Canadian metallurgical coal - some significant program changes have been effected. Also notable is the oil industry's much more active interest in coal and coal processing, which appears in part to be a consequence of last year's Middle East crisis. Several oil majors have been engaged in coal conversion studies (notably hydrogenation) for many years, and all indications now point to a much heavier commitment in this area, and to a growing number of companies so engaged.

For all practical purposes, coal R&D is still heavily dominated by government-affiliated agencies. Only two Canadian universities report any coal research activity. Private industry, aside from financially supporting certain beneficiation and carbonization programs in government institutions, continues to center its attention almost entirely on aspects of coal winning. Within the major research centers, however, a significant (and, in this reviewer's opinion, welcome) trend toward more integrated programming - i.e., to programming in which the close inter-relation between the three fossil fuels is more overtly recognized and acted upon - seems to be emerging. Rather than likely to cause a progressive scaling-down of current coal research efforts, this trend could go far toward removing the remaining (quite artificial) barriers between coal, petroleum and natural gas and thus allow better deployment of Canadian fuel science capabilities than the traditional "compartmentalization" permits.

EXPLORATION AND GEOLOGY

Spurred by the emergence of major markets for Canadian metallurgical coal, a number of western coal producers - as well as some newcomers to the coal industry - have continued to carry forward vigorous exploration programs in the Rocky Mountain foothills as far north as the Smoky river. With stress now on establishing mineable reserves and coal quality in selected areas, drilling activity was commonly followed up with careful sampling, analysis and beneficiation test programs; and, in some instances, tonnage quantities of prepared coal were also shipped to Japan for coke-making trials. No results of these investigations have so far been published, but the measure of success that has evidently accompanied them is indicated by announcements of three long-term coal export contracts and by the disclosure of plans for a \$3.5-million coal washing plant which Luscar Ltd., Edmonton, intends to erect in the Luscar region. Reportedly in the offing are at least two more contracts for coal export to Japan.

Meanwhile, the Research Council of Alberta (RCA) has continued its industry-supported coal survey in the plains regions of Alberta. Unlike exploration activity in the foothills, which seeks to prove up local coal deposits, the RCA program is only intended to detect potentially strippable major coal occurrences, and drilling is therefore carried out on a widely spaced 'grid' - that is, where necessary, it is freely modified to minimize terrain and access problems. The principal effort is currently concentrated in the Grande Prairie area where, in the summer of 1967, some 130 holes with an aggregate depth of 13,400 ft were drilled and logged. Of the coal showings so far reported, however, most are unpromisingly thin and geologically complex, and it is anticipated that at least two more field seasons will be necessary to complete an assessment of the area's coal resources.

In Eastern Canada, the only systematic exploration work has been undertaken by the Nova Scotia Research Foundation (NSRF) in the Pictou coalfield. The objective of this (essentially geophysical) study is elucidation of the basic geology of the region. Plans for extending investigations to a portion of the Mabou coalfields have been deferred.

As a corollary to earlier geological investigations, but also partly in support of present work, the Coal Research Section of the GSC has undertaken some important paleoecological studies. The paleogeography and facies of New Brunswick's Minto coal seam have been examined in depth (1). A detailed study of the petrographic make-up and coking properties of the 50-ft-thick 'Balmer' or No. 10 seam of British Columbia's Fernie Basin has been completed (2). Also, substantial progress is reported in concurrent investigations of the Fernie Basin's No. 1 seam and of the 11-ft-thick No. 4 seam of the Smoky River field. Because variations in coking propensities along or across a seam are, in many instances - as, for example, in the No. 1 seam near Natal, B.C. - connected with variable petrographic compositions rather than with systematic rank changes, petrographic seam profiles are being amplified with more detailed measurements of microlithotype and reflectance changes.

During the summer of 1967, Hacquebard and his associates also surveyed 'uraniferous' Tertiary lignites in southern Saskatchewan. In-situ scintillometer readings were, where warranted, supplemented with laboratory analyses for U_3O_8 but, with the exception of a few specimens collected south of the Frenchman river near Eastend (which showed "above background" scintillometer readings of up to 0.160 milliroentgen/hr and yielded ashes containing 350 - 650 ppm U_3O_8), uranium contents were generally negligible. Over-all, the findings confirm the results of earlier GSC surveys.

Finally, both GSC's Hacquebard and RCA's Campbell have continued their respective use of fossil pollen and spores to determine the age of sedimentary rocks and establish seam correlations. A summary of Hacquebard's work on a Permian section near the Tatonduck river (Yukon Territory) and on some Lower Mississippian type sections of Cape Breton Island has been included in a recent GSC publication (3).

MINING

Aside from examining possibilities for the local stripping of metallurgical coal - which private companies did in connection with their exploration work at several sites in the Rocky Mountain foothills - active work was mostly centered on matters related to strata control.

In cooperation with the Mines Branch's Mining Research Centre, Ottawa, the Nova Scotia Research Foundation has thus continued investigations into the deformation of various types of loaded steel arch supports, and made further measurements of minimum pillar sizes necessary for the maintenance of stable transport roadways in mines. The Foundation also completed a program of monitoring level openings of roadways in the Bras d'Or Company's Four Star mine in which a 300-ft longwall - half carried on Gullick supports and half on Wild supports - is being worked with an Anderson-Shearer mining machine fitted with self-advancing hydraulic supports. Similar studies of strata movements have now been initiated in new development areas of the Evans coal mine on Cape Breton's west coast.

The Mining Research Center (MRC) has meanwhile carried forward a cooperative program with two western coal companies in whose mines factors governing the stability of rock bolting are being explored. Also, in its laboratories, further progress has been made in studies directed toward the development of more meaningful techniques for measuring dust concentrations in mine atmospheres. The experimental methods adopted for that purpose have been briefly described in last year's review (4).

At the University of Alberta's Department of Mining and Metallurgy, Patching is nearing completion of an investigation into the rates (and total quantities) of gas release from selected Western Canadian coals. The results of this study, which are thought to bear on gas outbursts in mines, are being compared with corresponding data for a range of equivalent European coals and will be presented in a graduate thesis before being published elsewhere.

SAMPLING AND ANALYSIS

As an aid to significant coal analysis, Visman of the FRC's Western Regional Laboratory, Edmonton, has described an application of general sampling theory which permits advance evaluation of sampling precision (5). The method has now also been published as ASTM method D 2234 ('Sampling coal for coal ash analyses'). A new sampling procedure for float-sink analysis, which has been developed by the Laboratory and should command particular interest in connection with the development of new coal deposits, has also been submitted for consideration as an ASTM standard.

FRC's Solid Fuels Laboratory, Ottawa, has at the same time completed studies in which 'classical' and spectrophotometric techniques of coal ash analysis were compared. Experimental findings are being incorporated into a draft proposal for an ASTM standard. Also drafted was a 'referee' method for determining the total moisture content of coal in cases where established tests yield divergent results.

In response to growing industrial interest in Canadian coking coal, the laboratory further reports having carried out an extensive analytical evaluation of western coals. As in past years, regional laboratories of the FRC have again undertaken sampling and analysis of commercially prepared coals produced at all principal Canadian mines. In Western Canada, this work was accepted by the Western Regional Laboratory, Edmonton; in Eastern Canada, it was carried on by the Coal Resource Evaluation Unit at Glace Bay (which now occupies new quarters at the former Point Edwards Naval Base in Sydney, N.S.). In many instances, routine analyses were supplemented by determinations of washability characteristics.

At the Research Council of Alberta, analytical work has included the development of improved direct titration methods for estimating the concentration of functional groups in coal and coal products; in addition, a simple temperature control for gas chromatographs operating at sub-ambient temperatures has been described (6).

All Canadian coal laboratories have once again participated in a cooperative test program designed to ensure the reliability of coal analyses and, through FRC's Solid Fuels Laboratory, close liaison has been maintained with all relevant working committees of ASTM and ISO.

TRANSPORTATION

As noted in last year's review, an agreement between the Department of Industry and a consortium of companies - the latter joined together in the Solids Pipeline Research and Development Association (SPRDA) and the Solids Pipeline Economic Study Association (SPESA) - has enabled the Research Council of Alberta to build a 3,600-ft-long, 4-in.-diam. pipeline loop and, in this facility, to test the transmission of rigid capsules and coal-paste slugs on a larger scale than had previously been possible.

The field installation (7) was commissioned in the fall of 1967, and trials in which both water and oil were used as carrier fluids were carried on throughout the winter. The tests were principally concerned with determining the flow characteristics of different capsule (and slug)

configurations at flow velocities of up to 12 ft/sec., and with elucidating the effects of capsule densities and dimensions under various flow regimes. In addition, however, considerable attention was also directed to such matters as capsule fabrication, injection and retrieval, abrasion, pump by-pass systems and the behaviour of long capsule or slug 'trains' during extended flow.

A report covering this first phase of the pilot operations, which was completed in March of 1968, has been submitted to SPRDA-SPESA. (Companion reports, compiled by SPRDA-SPESA consultants, deal with associated engineering aspects and pipeline economics and are expected, in conjunction with the RCA report, to afford a basis for establishing the scope of a possible Phase II program).

STORAGE

Because weathering of coking coal during storage will frequently cause serious deterioration of coking properties, FRC's Metallurgical Fuels Engineering Section has begun a detailed study of oxidation phenomena. Of the two experimental approaches used for this purpose, one involves examination of the loss of dilation upon progressive mild oxidation of the coal, and the second (which attempts to develop a sensitive direct method for detecting coal oxidation) is based on pyrolyzing the coal sample and quantitatively converting all evolved water, CO and CO₂ to carbon monoxide over a suitable catalyst. The laboratory reports that initial oxygen determinations by this latter technique compare favourably with oxygen measurements made on mineral-matter-free coal samples by neutron activation analysis, and has therefore concluded that the method is sufficiently promising to warrant further development.

As an adjunct to studies of weathering, the Metallurgical Fuels Engineering Section has also initiated an investigation into the composition of pyrolysis gases evolved from coking coals after more or less extended low-temperature oxidation.

PREPARATION

The Western Regional Laboratory's work on coal cleaning by compound water cyclones and other devices has now reached a stage at which emphasis has shifted to the design of flexible modular beneficiation plants. For this purpose - and partly in response to specific enquiries and industrial problems - the Laboratory has begun to evaluate the performance of jigs, separators, cyclones and tables, and to analyse difficulties posed by such matters as build-up of recirculating slimes. With the enforcement of more stringent pollution controls, and in the light of the expected increasingly large production of cleaned metallurgical coal in Western Canada, this aspect of coal beneficiation is thought to require rather more attention than has so far been given to it.

An interesting novel development is the Laboratory's use of computer programs to obtain yields and ash contents at various cutpoints and, in this manner, to facilitate the calculation of plant performance from coal washability characteristics.

The Western Regional Laboratory and FRC's Metallurgical Fuels Engineering Section in Ottawa also report important further progress in coal desulphurization through the use of modified conventional cleaning techniques. Following studies in which pyrite distributions in coal were examined, it has now been established that compound water cyclones can reduce sulphur contents to >1 per cent in the Cape Breton coal studied (cf. Coal Research in Canada, 1966). Equally significant, however, is the confirmation of earlier observations that the moisture contents of cleaned, desulphurized fine coal can, in most cases, be lowered to >6 per cent by adding hydrocarbons (including coke-oven light oils) to the prepared coal and then centrifuging the mixture. It is considered that this procedure eliminates relatively expensive thermal drying processes to which the desulphurized coal would otherwise have to be submitted before it could be charged to coke ovens. The Dominion Coal Board, which has provided financial support for the work and also retained a firm of consulting engineers to keep it under continuous review, has now received proposals for the installation of a semi-commercial pyrite separation unit. If built, this plant also could play a major role in exploiting a potential market for low-iron-content coke which is developing in Newfoundland.

CARBONIZATION

FRC's active interest in "spherical agglomeration", to which reference was made in last year's review, has been carried several steps forward to eventual development in a continuous pilot-plant unit.

In essence, spherical agglomeration represents an attempt to make cleaned and/or desulphurized small coal, which would generally be too finely comminuted for conventional carbonization practices, amenable to commercial coke production. The process accordingly consists of two distinct stages. In the first, a coal-water slurry is balled with coke oven tars or light oils to form low-ash $1/16$ - to $3/16$ -in. spheres with moisture contents between 1 and 3 per cent; in the second, the spheres are hardened by a 'preheat' treatment, which promises to be a feasible method for the preheating of coke oven charges to achieve gains in productivity. The finished product can then either be directly charged into coke ovens or blended with other coals before being charged.

Aside from directing some further attention to agglomeration per se, FRC has, therefore, throughout the year under review, carried out 500-lb-scale coking tests with blends containing agglomerates; in addition, a number of trials were run in the Laboratory's BM/AGA oven in order to assess the by-product (tar and oil) yields obtainable from the blends. Coke quality of 'conventional' cokes, and roughly 50 per cent of the tars used for coal agglomeration was recovered. A balanced over-all operation, requiring no additional (extraneous) tar, is therefore possible as long as tar consumption for the production of the spheres is held to below 10 per cent. The Laboratory is now engaged in developing a continuous agglomeration pilot unit. The Dominion Coal Board has supported this work as well as related research by the Nova Scotia Research Foundation. The National Research Council (Ottawa) has also conducted related studies.

Because of the expected rapid expansion of the coking coal industry of Western Canada, a growing need for petrographic (and related) studies is now manifesting itself, and FRC's Metallurgical Fuels Engineering Section has, accordingly, also devoted considerable attention to these matters. Of particular importance is the Laboratory's observation that the Gray-Shapiro method for predicting coke strength from petrographic measurements on coal - a method which has gained wide use in the United States - must be modified when applied to coals containing substantial proportions of granular micrinite. Unlike massive micrinite, which remains essentially unaltered by low-temperature heat treatment or fuses only slightly (and which will consequently form distinct centers of weakness in a coke), granular micrinite tends to break up into rod-like aggregates at 440°C and to lose its separate identity at 450°C. It has consequently been inferred that this coal constituent can make significant positive contributions to coke strength.

Details of these studies - and a discussion of the visual and chemical changes which other coal macerals undergo at elevated temperatures - have been presented in a series of papers to the 7th International Conference on Coal Science (Prague, June, 1968) and are expected to be published later this year.

The Research Council of Alberta has meanwhile further advanced a broad basic study of coal pyrolysis mechanisms. The results of an enquiry into the kinetics of CO and CH₄ evolution from coals at temperatures between 550° and 650°C - i.e., at temperatures at which these gases are the only major pyrolysis products - have been published (8); and progress is reported in a similar investigation in which attention centers on the kinetics of tar formation and discharge at 550°C. The experimental methods used for this purpose are special adaptations of gas chromatographic techniques which have been described in earlier papers dealing with the program.

A concurrent adjunct study of coking coals at RCA has also provided evidence for the view that chloroform-solubility, which some coal chemists tend to connect with coal plasticity, may not play a direct role in this phenomenon. It has been shown that although mild treatment of a coking coal with boron trifluoride at 200°C will destroy coking properties, it does not measurably affect the quantity and i.r. spectra of the extracts; neither does it alter the i.r. absorption spectra of the reacted residue between 700 and 900 cm⁻¹, where three 'aromatic bands' have also been regarded as characteristic of coking coals (9).

Industrial carbonization in Canada has been discussed by Botham (10), and Walsh and Drake have recently also offered an outline of the objectives and current activities of the Canadian Carbonization Research Association (11).

COMBUSTION

Combustion research, centered at FRC's Canadian Combustion Research Laboratory, Ottawa, has been heavily influenced by increasing recognition of the need to control atmospheric pollution. Considerable stress has therefore, during 1967, been laid on the design and performance of combustion systems that promise to minimize the formation of SO₃, CO, unburned hydrocarbons and carbon soot at the source.

Of particular interest, in this connection, is the Laboratory's confirmation of its earlier discovery (cf. Coal Research in Canada, 1966) that magnesia-alumina additives can effectively neutralize SO_3 and control the build-up of acid soots. Trials with a 2.5 per cent sulphur-bearing oil, which was burned under a small research-type boiler with 5 per cent O_2 in the flue gas, established that such additives will not only neutralize all acid soot and acid condensed on boiler surfaces, but also remove 13 to 30 per cent of all nitrogen oxides, 11 to 19 per cent of all SO_2 and 71 to 80 per cent of all SO_3 in the free gas stream (12).

When burning coal, additives appear to be rather less effective; but promising results can, in many cases, be brought about by cations contained within the coal's own ash. During pulverized-fuel test firings of a high-sulphur Eastern Canadian coal, it was thus repeatedly observed that cations in its ash neutralized 74 per cent of total absorbed SO_3 which was analyzed at 640 ppm (13). Further attention to the role of coke ash in combustion and pollution control appears therefore to be fully warranted.

Concurrently with its work on additives, the Combustion Laboratory has also focused attention on the dispersion of combustion gases in the atmosphere and developed a control standard which is intended to assist designers in calculating dust separator efficiencies and stack heights. Publication of this standard is expected shortly.

Investigations into aspects of pulverized coal firing have been mainly concerned with the behaviour of Onakawana (northern Ontario) and Saskatchewan lignites in the Laboratory's research boiler, and have involved detailed analysis of boiler-fouling by the heavy, sintered ash of the Saskatchewan lignite. Somewhat unexpectedly, the Onakawana lignite did not create similar problems, and efforts are now in progress to determine whether this difference is connected with the distinctly different flame characteristics of the two lignites.

With respect to its Dominion Coal Board-supported work on the Will-Burt stoker, to which reference was made in last year's review, the Laboratory reports that levelling of the grate - which originally sloped to the rear and promoted wind-rowing - resulted in a significant improvement of the stoker's 'hold fire' characteristics. Other design changes involved provision of an automatic coal-fired igniter - a small vibrating grate which burns normal stoker coal and functions as an ignition source during long 'hold fire' periods of the main stoker grate.

Finally, the Combustion Laboratory has commenced the design of a tunnel furnace that will permit more comprehensive research into flame hydrodynamics. It is expected that this unit will become a vital ancillary to further combustion studies.

NON-FUEL USES

Long-range basic and applied investigations directed toward the use of coal as a source of chemicals and carbons have again been centered at the Research Council of Alberta, Edmonton, and covered a fairly wide spectrum (cf. Annual Review for 1966).

In connection with a broad study of coal-based nitrogenous plant nutrients (14), it has now been established that products of the coal-ammonia-oxygen reaction (15) are generally incapable of releasing nitrogen to a soil at useful rates. That they are rather effective nitrogen sources (comparable to urea of ammonium nitrate; ref. 14) after further processing with nitric acid and ammonium hydroxide appears to be mainly due to the fact that such treatment converts a portion of the mineral matter into water-soluble nitrates. From observed plant responses, however, it has also been inferred that these (essentially physical) mixtures of nitrogen-enriched coal and inorganic nitrogen source may display synergistic behaviour - i.e., that nitrogen from the enriched coal may become 'available' to soil microorganisms because of the presence of small quantities of ammonium nitrate (or urea). To explore this possibility, and the physical variables of mixtures that govern nitrogen release rates, a carefully planned series of test mixtures has been prepared and is currently undergoing laboratory and greenhouse evaluation. At the same time, attention has been focused on some novel humic acid derivatives that have shown promise in preliminary nitrogen-release measurements and greenhouse tests. The preparation and properties of these substances are currently the subject of more detailed studies.

Further bench-scale work is also reported on the preparation of potentially useful phosphorus-bearing coal derivatives which are under test by the University of Alberta's Department of Soil Science.

Sulphomethylation of coal and coal humic acids (16) has entered active pilot-plant development under the terms of an agreement between a private sponsor and RCA's Product R&D Division. Additional performance tests in 1967 have confirmed earlier indications that the sulphomethylated products serve as excellent drilling mud additives and that they might, *inter alia*, also be of considerable practical value as controls over slurry viscosities.

With respect to coal-based carbons, further work on the utility of sized coke fines as water purification media has now established a clear superiority of coke over conventional sand and gravel beds. A summary of the investigations, which had hitherto only been available in two theses of the University of Alberta's Faculty of Graduate Studies, has been published by Bouthillier (17). Good progress is also reported in a related Dominion Coal Board-supported study in the University of Waterloo's Department of Chemical Engineering which is concerned with the ability of coal chars to remove dissolved 'chemical oxygen demand' from waste waters.

In order to assess the possible roles of carbons in the processing of raw waters and (liquid and gaseous) industrial effluents, the Research Council of Alberta has also expanded an enquiry into the ion-exchange properties of oxidized (or otherwise chemically treated) coals, and commenced a study of the sorption of acidic organic compounds by carbonaceous solids from aqueous solutions. In the former case, present interests focus on the exchange of water-carried Na and Ca against H; in the latter, special attention is being directed to molecular degradation reactions at carbon surfaces. Both projects are being pursued as long-range investigations.

RCA's high-temperature chemistry work with gas plasmas, to which brief reference was made in last year's review, has mainly centered on metal oxide and chloride reduction reactions; but it is relevant to record that several of these studies have involved the use of carbon electrodes and/or carbon-lined reaction chambers as sources of reductants.

A study of interactions between carbonaceous solids and discharge-generated excited hydrogen species - for which the Dominion Coal Board has again provided partial support - has reached the point at which data for reaction kinetics and product distributions can be published. A paper on these topics is in press (18).

19th DOMINION-PROVINCIAL CONFERENCE ON COAL

The annual Dominion-Provincial coal conference was, in 1967, held in conjunction with INDEX '67 in Regina, Saskatchewan. Papers presented at the conference have been published in 'Index 67 Proceedings' and are, for convenience, also listed in the bibliography appended to this review.

The 20th (1968) conference will be held at the Chateau Frontenac, Quebec City, P.Q., on September 12-13, and will be preceded by a one-day colloquium on 'Coal and Coal Products' which will feature discussion of coal conversion processes and non-fuel uses of coal. An announcement of the colloquium and of its proposed scope has appeared in the CIM Bulletin.

ACKNOWLEDGEMENTS

The reviewer is once again indebted to Messrs. A Brown (Dominion Coal Board), H.D. Smith (Nova Scotia Research Foundation), T.E. Warren (Saskatchewan Research Council), H.A. Hacquebard (GSC, Ottawa), J. Visman (Western Regional Laboratory) and T.A. Patching (University of Alberta) for providing notes from which this summary has been compiled. Apologies are extended for any inadvertent omissions.

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APPENDIX 57

LIBRARY OF PARLIAMENT

BRIEF TO
THE SENATE OF CANADA
SPECIAL COMMITTEE ON SCIENCE POLICY

O T T A W A

MARCH 1969

INTRODUCTION AND SUMMARY

1. Parliament is the most important operation in Canada. Its decisions affect all Canadians and millions of other people throughout the world.
2. Obviously, it is essential that Parliamentarians have up-to-date, relevant information, whenever needed.
3. The Library of Parliament is the only operating agency specifically established to provide information of all kinds, and at all times, to all Federal Parliamentarians.
4. The Parliamentary Librarian is responsible to the Speakers of the two Houses of Parliament assisted by the Joint Committee on the Library of Parliament.
5. The Library of Parliament's three branches, Reference, Research, and Cataloguing, are primarily organized to collect in anticipation of need, organize and store, retrieve, rework (if necessary), and disseminate, the information requested by Parliamentarians.
6. Roughly one-third of the Library's nearly 300,000 volumes are government documents. The remainder are largely in the field of the social sciences and related areas - economics, history, law, political economy, and sociology. A rapidly decreasing proportion of the collection is literature, religion, and unwanted books received on copyright deposit.

-INTRODUCTION & SUMMARY continued -

7. As the National Library has increasingly assumed our older storage function (in addition to its more vital and important roles) the Library of Parliament has been able to improve its services to Parliamentarians. A clipping service was established in 1963, the Research Branch, and Committee indexing in 1965.
8. Fortunately, the Library of Parliament can depend on the National Science Library and other specialized libraries for information of a highly technical and purely scientific nature, and there is no need for large-scale duplication.
9. Nevertheless, the Library of Parliament remains free to build its collection to suit the needs of Parliament, and this independence is necessary to its proper function.
10. Because of the quality and accessibility of its collection, the Library of Parliament feels obligated to serve "strangers", when service to Parliamentarians does not prohibit this, and is rewarded in turn by the co-operative assistance of others.
11. The chief future requirement of the Library of Parliament is more space to accommodate even better and more numerous Research Officers, Librarians, and their assistants.

INTRODUCTION AND SUMMARY continued -

12. Science and automation presently affect the Library indirectly, but in the near future should offer considerable possibilities for improved service. We have requested an outside survey of automation potential to assist us in planning for the future.
13. The ready availability of material likely to be required is a matter of good judgment, intuition, space, and money. The ability to evaluate the usefulness of material to Parliamentarians, or re-work it into useful form, is a matter of training, experience and judgment, and should be well-rewarded.
14. Beyond Parliament, as the Library of Parliament does not work in isolation, the roles of the National Library and the National Science Library should be carefully re-examined together and each clearly assigned a complementary, co-equal role, within its own disciplines. Both National Libraries serve distinctively useful functions.

RECOMMENDATIONS

1. Adequate, convenient accommodation must be secured for increased numbers of Research Officers, Librarians, and their assistants. This space must be in new buildings on Parliament Hill or immediately adjacent to it if readily available service is to be maintained with little wasted effort. The South side of Wellington Street between Metcalfe and O'Connor should be purchased, and possibly the entire block through to the Mall excluding only a living commercial façade on the Sparks Street Mall itself. This would, of course, provide adequate room for all Parliamentary activities and ensure that the space problem would not hobble future operations.
2. Provision should be made for higher salaried Research Officers of graduate faculty calibre and Librarians with more specialized training in order to secure the finest quality service to Parliamentarians.
3. Extra funds should be reserved to hire experts for short-term employment or to produce special studies when required. The concentration of "retired brains" in Ottawa would make this most rewarding.

RECOMMENDATIONS continued-

4. Consideration might be given to the formation of committees to help develop friendly, effective, and prompt formal co-operation between both Houses of Parliament and the Library of Parliament in the matter of Information Services on Parliament Hill. A Policy Committee on Information Services, and a Management Committee on Information Services are both recommended. The ultimate goal might well be greater co-ordination for all services.
5. Beyond Parliament, as the Library of Parliament does not work in isolation, the roles of both the National Library and the National Science Library should be carefully re-examined together and each clearly assigned a complementary, co-equal role within its own disciplines.
6. There should be a greater rationalization of federal government expenditure on Library/Information. The new National Library Act should help in this regard, but careful consideration should also be given to preparing a special National Science Library Act.

Special Committee

PART II 2.1 ORGANIZATION2.1.a. ORGANIZATION OF THE LIBRARY OF PARLIAMENT

(Diagram 2.1.a.) page 7.

2.1.b. PARLIAMENTARY REPORTING CHANNELS

The activities of the Library of Parliament are reported by the Parliamentary Librarian "to both Houses, through Mr. Speaker, at the opening of each session". (Appendix 1, Library of Parliament Regulations, #2).

In addition, "The Joint Committee on the Library of Parliament shall meet at the call of the Joint Chairmen at least once in each Session". (Appendix 1, Library of Parliament Regulations, #1)

2.1.c. ORGANIZATION OF UNITS RESPONSIBLE FOR
SCIENTIFIC ACTIVITIES

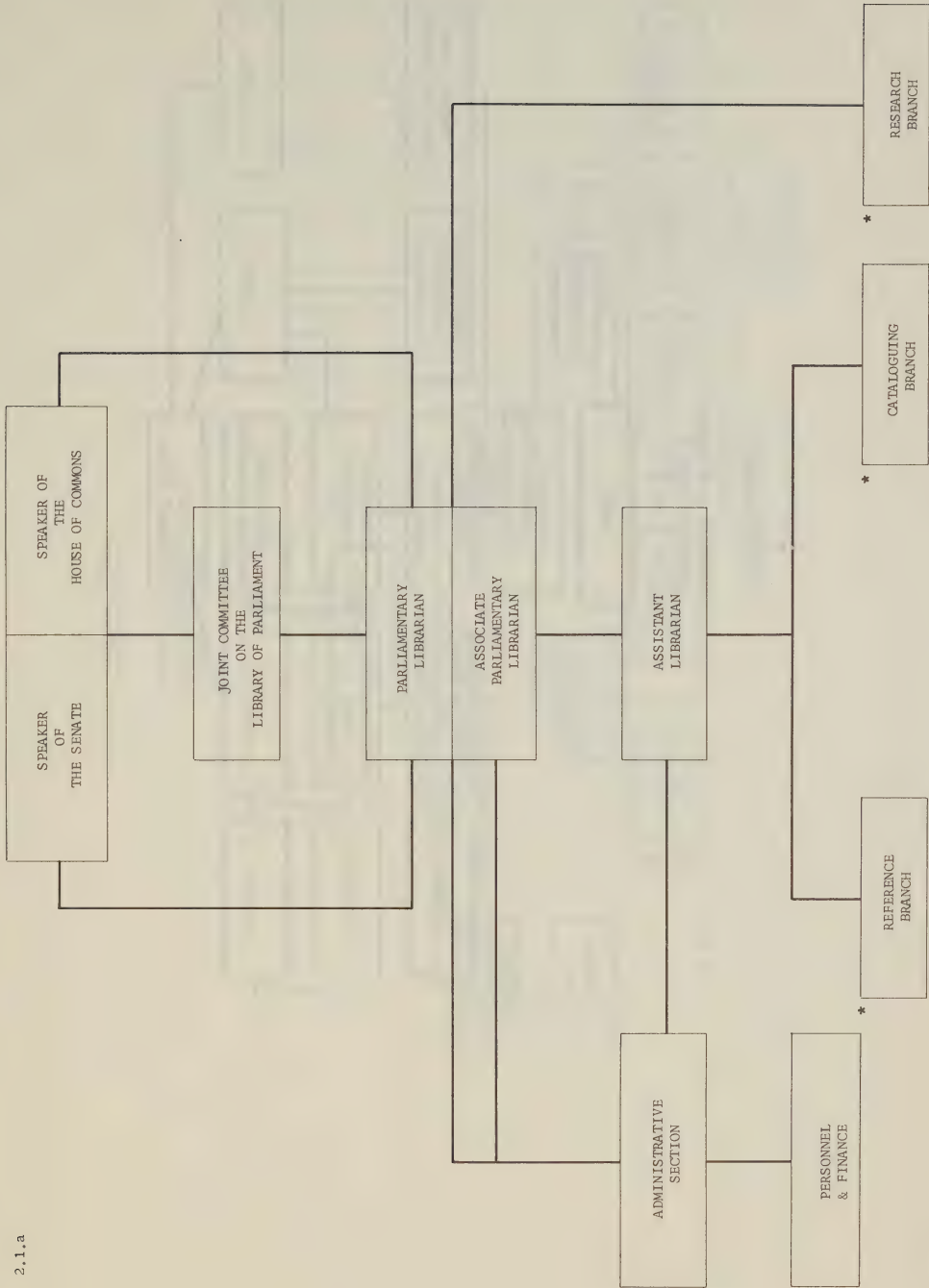
(Three diagrams 2.1.c.) pages 8, 9, 10.

2.1.d. FORMAL AGREEMENTS WITH AGENCIES OUTSIDE CANADA

These agreements concern the exchange of official and/or scientific publications.

(A) Exchanges of governmental publications, principally parliamentary, between this library and foreign agencies. Many of these agreements were made

Diagram 2.1.a
LIBRARY OF PARLIAMENT



*Units conducting scientific activities.

Diagram 2.1.c

LIBRARY OF PARLIAMENT
REFERENCE BRANCH
April 1, 1969

2.1.c

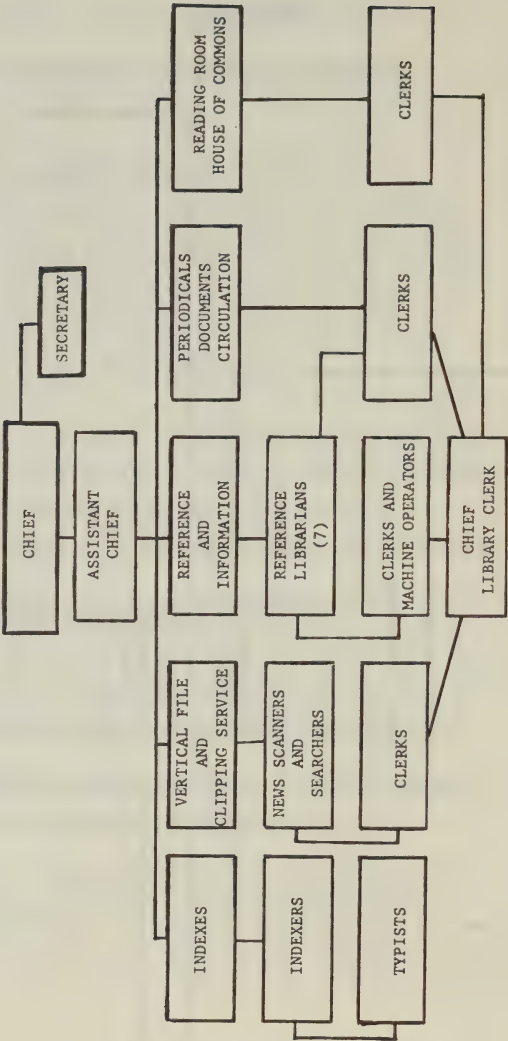


Diagram 2.1.c

LIBRARY OF PARLIAMENT
CATALOGUING BRANCH
April 1, 1969

2.1.c

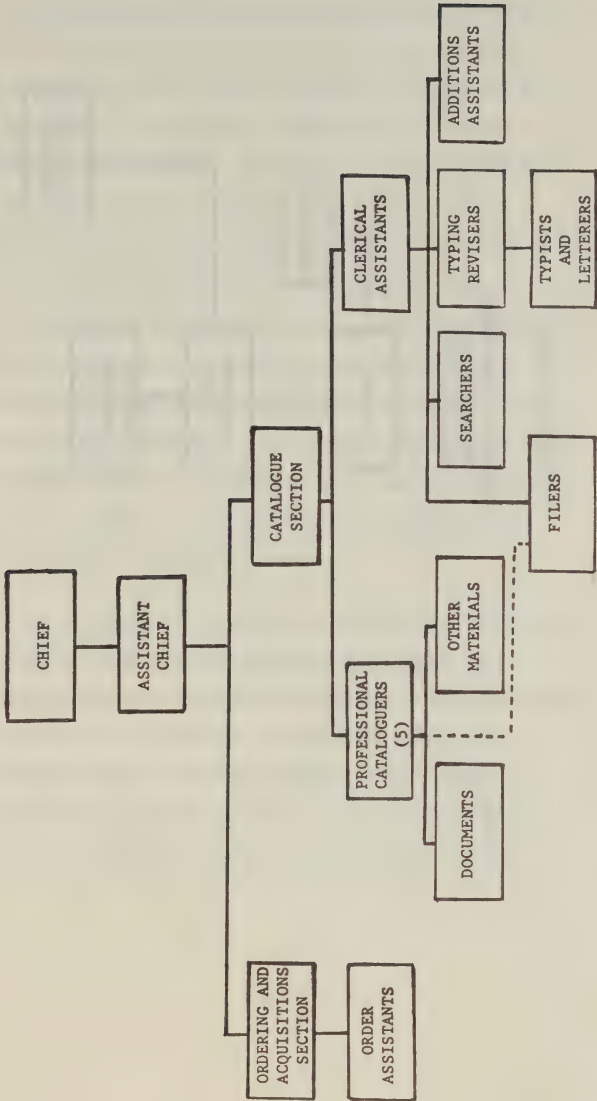
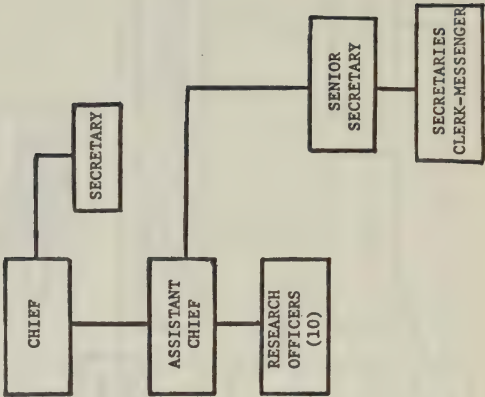


Diagram 2.1.c

LIBRARY OF PARLIAMENT
RESEARCH BRANCH
April 8, 1969

2.1.c



2.1.d. FORMAL AGREEMENTS WITH AGENCIES OUTSIDE CANADA continued-

before Confederation or shortly afterwards, and have resulted in a good research collection for study of the development of parliamentary government in the older Commonwealth countries. For example, exchanges with the Australian states and South African provinces began before these colonies united into Federations. (Most of these state/provincial publications have now been transferred to the National Library, however). Exchanges still conducted by the Library of Parliament include those with Australia, Britain, France, New Zealand, the U.S.A., and the Union of South Africa. The shipment of Canadian material is normally done by the Queen's Printer, but some items, like *THE CANADIAN PARLIAMENTARY GUIDE* are purchased and mailed directly.

(B) Exchanges of scientific material between government (federal and provincial) departments, agencies and institutions in some foreign countries. In these exchanges the Library of Parliament receives bulk shipments and forwards them to individual institutional recipients in Canada. Most of this material is now received from the Institut Danois des Échanges Internationaux (I.D.E.).

2.2 ORGANIZATIONAL FUNCTIONS2.2.a. STATUTORY FUNCTIONS AND POWERS:
LIBRARY OF PARLIAMENT ACT

The statutory functions and powers of the Library of Parliament derive from its own Act in relation to the Library of Parliament (S.C. 1871, c. 21 - now the Library of Parliament Act. R.S. 1952, c. 166, as amended by S.C. 1955, c. 35. See Appendix 2.)

The Library, as such, was formed initially by the amalgamation of the legislative libraries of Upper and Lower Canada some time after these two provinces were united into the Province of Canada in 1841.

Its functions are not defined by statute except to make it responsible, in the Queen's name, for "all books, paintings, maps, and other effects that are in the joint possession of the Senate and House of Commons of Canada, or are hereafter added to the existing collection...". (R.S. 1952, c. 166, s.2. Appendix 2). This relatively passive activity, collecting and maintaining, is the only legally defined function of the Library of Parliament.

Fortunately, however, "The Speakers of the two Houses of Parliament, assisted by the joint committee, may, from time to time, make such orders and regulations for the

2.2.a.

STATUTORY FUNCTIONS AND POWERS:
LIBRARY OF PARLIAMENT ACT continued-

government of the Library, ... as to them seem meet, subject to the approval of the two Houses of Parliament." (R.S. 1952, c. 166, s.4. Appendix 2).

Furthermore, "The Parliamentary Librarian, the Associate Parliamentary Librarian and the other officers and servants of the Library of Parliament are responsible for the faithful discharge of their official duties, as those duties are defined by regulations agreed upon by the Speakers of the two Houses, and concurred in by the joint committee on the Library." (R.S. 1952, c. 166, s.9 - as amended by S.C. 1955, c. 35, s. 2. Appendix 2)

Thus it appears that the functions of the Library of Parliament may be expanded indefinitely to serve the needs of Parliament, or, if need decreases, contracted to the original more passive role.

"The direction and control of the Library of Parliament, and of the officers and servants connected therewith, is vested in the Speaker of the Senate and the Speaker of the House of Commons for the time being, assisted, during each session, by a joint committee

2.2.a.

STATUTORY FUNCTIONS AND POWERS:
LIBRARY OF PARLIAMENT ACT continued-

to be appointed by the two Houses." R.S. 1952, c. 166,
s. 3. Appendix 2).

The Parliamentary Librarian who "has the rank of a
deputy head of a department" has the direct "control
and management of the Library" (R.S. 1952, c. 166,
s. 5(2), as amended by S.C. 1955, c. 35, s. 1. Appendix 2)
under the Speakers of the two Houses and the joint committee
on the Library.

2.2.b.

ORGANIZATIONAL POLICIES

Our "science policy" is, of course, only a part of our
over-all policy of helping Parliamentarians ^{1/} be well-
informed by providing relevant facts and background material
to help them perform their duties in a knowledgeable manner.
In order to provide the required printed and other information,
special papers, and staff, we:

1/ Broadly speaking, this term includes all those to
whom we must lend under our Regulations - "the Governor
General, members of the Privy Council, Members of the
Senate and of the House of Commons, officers of the two
Houses, Justices of the Supreme Court of Canada and of
the Exchequer Court, members of the Press Gallery".
(Appendix 1 Library of Parliament Regulations #3).

2.2.b. ORGANIZATIONAL POLICIES continued-

- select and acquire materials giving all facts and opinions likely to be needed;
- organize and maintain this voluminous material for ready availability;
- select and recommend the appointment of qualified staff;
- fight for space to house, and funds to pay for, the staff and materials essential for our work.

The Library of Parliament is organized into three main operational branches:

1. The REFERENCE BRANCH whose professional librarians (assisted by clerks) provide answers to requests for information, select and provide source material for speeches and letters, maintain a vertical file and clipping service, prepare bibliographies, indexes, and abstracts, lend library material, and operate copying facilities;
2. The RESEARCH BRANCH, established in 1965, whose lawyers, economists, and other professional personnel prepare requested research papers and notes for speeches, and provide staff consultation to procedure committees of the House of Commons, parliamentary associations, and individuals;

2.2.b. ORGANIZATIONAL POLICIES continued-

3. The CATALOGUE BRANCH whose professional librarians and assistants order and then organize for use, by established methodical classification and cataloguing procedures, the materials received.

The Library of Parliament's main interest in the field of scientific activities has always been the collection and dissemination of information. Until quite recently the activity most strenuously pursued was the collection and organization of published monographs, serials and official reports. Especially during the Library's earlier years relatively little was done to make the information in these publications more readily accessible. Efforts were made simply to set up requesting and receiving procedures, and after receipt, organize materials in such a manner that a document, monograph, or article in a serial could be produced to answer a specific request. As the interests of parliamentarians change, the duties of the library staff also change, and more intensive use is now being made of the collection, aided by such techniques as abstracting, indexing, and photocopying. Paralleling a growing interest in

2.2.b. ORGANIZATIONAL POLICIES continued-

science and technology, economics, finance, and world affairs, and a lessening of parliamentary requests relating to literature and history, has come a change in materials added to the library's collection.

The establishment of the National Library and the National Science Library to act as national repositories and to provide national service is making it possible for the Library of Parliament to direct the growth of its collection and to concentrate its services into areas of immediate and continuing interest to Canadian parliamentarians. At the same time, it is possible for the Library of Parliament to use the collections and services of the two National Libraries and the many specialized libraries within government departments in areas of peripheral or highly technical interest in which it would be wasteful to attempt to maintain an independent collection. No single institution can now encompass all fields.

Even in its very early years, while still the Legislative Library of the Province of Canada, the Library was aiding scientific publishing and research. In 1853, for instance,

2.2.b. ORGANIZATIONAL POLICIES continued-

monetary assistance was given to the Journal of the Canadian Institute which published scientific papers, and also directly to a M. Morin who was engaged in copying, in the Paris Archives, various maps relating to the geography of Canada. And in the same year the Library was promised, on exchange, the publications of the Smithsonian Institution. An early instance of the purchase of important and expensive works of science was the 1857 purchase of Audubon's THE BIRDS OF AMERICA and THE QUADRUPEDS OF NORTH AMERICA for \$1,100. By 1857, arrangements for the exchange of official documents with the United States had been established and this exchange resulted in the deposit in the Library of many scientific publications.

2.2.c. FUNCTIONS AND RESPONSIBILITIES/
ASSISTANCE TO NON-PARLIAMENTARIANS1. GENERAL

Because of the quality, size and ready availability of the Library's collection, our Reference Branch sometimes provides substantial assistance to Royal Commissions, government departments, the academic community, and other non-parliamentary groups and individuals when such service does not interfere with parliamentary priority.

2.2.c. FUNCTIONS AND RESPONSIBILITIES/
ASSISTANCE TO NON-PARLIAMENTARIANS continued-

2. IN RELATION TO OTHER AGENCIES

(i-iii) Federal Agencies, Industry,
Educational Institutions

The Library assists federal employees by providing research materials for use in connection with their work. This is done either by providing individual access to the Library's facilities or by lending material on Inter-Library Loan to the Agency involved. This function can be filled only to the extent it does not interfere with the Library's prime purpose of serving Parliament, of course.

In addition, the Library's internal responsibilities frequently lead to the production of work which is useful to other federal agencies, industry, and educational institutions.

For example, our staff prepared a translation into French of the subject-headings required for our French card-catalogue. This was published in 1963 as *REPertoire DES VEDETTES-MATIERE/SUBJECT HEADINGS USED IN THE FRENCH CATALOGUE*, and sold by the Queen's Printer. Similarly, we prepared our own classification scheme for the Library's collection of law materials, and this, too, is used by other libraries.

2.2.c.

FUNCTIONS AND RESPONSIBILITIES/
ASSISTANCE TO NON-PARLIAMENTARIANS

2.

IN RELATION TO OTHER AGENCIES
(i-iii) Federal Agencies, Industry,
Educational Institutions continued-

The bi-monthly annotated *SELECTED ADDITIONS LIST/*
LISTE D'ACQUISITIONS RECENTES prepared by the Library's
Reference Branch is distributed not only to Senators
and Members, but also to the National Library, Canadian
provincial legislative libraries, and other selected
libraries.

In recent years a number of selected special bibliographies,
e.g. *CAPITAL PUNISHMENT/LA PEINE DE MORT, CONSUMERS AND*
CONSUMER PROBLEMS/LE CONSOMMATEUR ET SES PROBLEMES, CRIME
AND CRIMINAL JUSTICE/CRIME ET JUSTICE which had been
prepared for internal use by the Reference Branch have been
made available to other libraries.

Our most recent project is the preparation of detailed indexes
to the Minutes of Proceedings of Committees of the Senate and
House of Commons of Canada.

The Parliamentary Librarian and his staff have given advice
regarding other library matters to departments and organizations,
and have also served as technical advisers on selection boards of
the Public Service Commission.

2.2.c. FUNCTIONS AND RESPONSIBILITIES/
ASSISTANCE TO NON-PARLIAMENTARIANS

2. IN RELATION TO OTHER AGENCIES

(iv) International Representation

The Library of Parliament takes an active interest in such international organizations as the International Federation of Library Associations. For the past three years the Parliamentary Librarian has served as the senior Canadian voting representative to the annual conference of IFLA, and is presently Canadian Correspondent for its Parliamentary and Administrative Libraries. He is also Canadian Correspondent for the Inter-Parliamentary Union's International Centre for Parliamentary Documentation at Geneva.

The Research Branch has also supplied information on Canada for inclusion in the Commonwealth Parliamentary Association's publication *REPORT ON WORLD AFFAIRS* (formerly *REPORT ON FOREIGN AFFAIRS*). Specialists from the Research Branch have served such organizations as the Commonwealth Parliamentary Association, the Canada-France Parliamentary Association, l'Association internationale des Parlementaires de langue française, and the Inter-Parliamentary Union by preparing background papers relating to conference items, or articles for publication relating to Canadian affairs, and by providing advisory assistance to their Canadian representatives.

2.2.c. FUNCTIONS AND RESPONSIBILITIES/
ASSISTANCE TO NON-PARLIAMENTARIANS

2. IN RELATION TO OTHER AGENCIES

(v) Others

(A) Our relationship with Canadian provincial legislative libraries is particularly good as we return their assistance by providing priority attention to their needs.

(B) The Library is becoming the public's Information Centre for Parliamentary Information. Letters addressed directly to the Library, letters addressed to the House of Commons (formerly answered by the Clerk's Office), and letters to Senators and Members, are either answered directly or the information provided for their answer.

We are listed in the *CANADA YEAR BOOK* as a source of information under the following entries CONSTITUTION, ELECTIONS, GOVERNMENT, LEGISLATION, and PARLIAMENT. The Senate, and the House of Commons will no longer be listed in future under LEGISLATION and PARLIAMENT.

(C) Library Associations (in Canada)

Librarians on the staff frequently serve as officers or members of the executives of the federal, provincial and

2.2.c. FUNCTIONS AND RESPONSIBILITIES/
ASSISTANCE TO NON-PARLIAMENTARIANS

2. IN RELATION TO OTHER AGENCIES
(v) Others

(C) Library Associations (in Canada)
continued -

local library associations or of sections of these associations. The Parliamentary Librarian and the Assistant Librarian each served for several years on the Board of the Institute of Professional Librarians of Ontario, and each was President for a one-year term. Both, also, have served on the Council of the Canadian Library Association, and as Chairmen of Sections or Committees, and they and other staff members have assisted in the Association's projects. The Chief Reference Librarian, for example, helped with the preparation of a bibliography of reference works for use in Canadian libraries. A number of staff members have served at different times as members of the Executive of the Library Association of Ottawa, and of the Librarians' Group of the Professional Institute of the Public Service of Canada.

2.2.d. REVIEW OF EFFECTIVENESS, DUTIES AND GOALS

Our "operational effectiveness, duties, and goals are reviewed and revised" yearly during the period of budget preparation. In addition, the meetings of the Joint Committee on the Library of Parliament provide a sounding board for complaints or praise, suggestions or questions. Furthermore, as we serve a small clientele, and are readily accessible to them, improvements may be initiated promptly. The deputy minister status of the Parliamentary Librarian helps as he holds effective administrative power with direct access to his two "Ministers", the Speaker of the Senate and the Speaker of the House of Commons. The Library budget and significant changes in duties and goals are, of course, approved by both Speakers.

2.2.e. OUTSIDE STUDIES TO IMPROVE OPERATING PROCEDURES

The most important study commissioned during the last five years was the *ORGANIZATION STUDY OF THE LIBRARY OF PARLIAMENT* completed by the Organization Division, Advisory Services Branch, Civil Service Commission, in December, 1964. Its twelve recommendations are attached as Appendix 3. The other study commissioned within this period was *CLASSIFICATION SURVEY OF THE LIBRARY OF PARLIAMENT, 1965*, and it dealt with each individual staff position at that time.

2.2.f. RESPONSIBILITIES AND POWERS IN RELATION TO
ACTIVITIES AND PROGRAMMES

This agency's main responsibility "helping Senators and Members of Parliament to be well-informed" is somewhat awesome, but fortunately, we do not assume full responsibility for this, and we naturally lack any "powers" to compel those we serve to use our facilities.

Our activities remain low-key though we work to inform Parliamentarians of our services. We write directly to each new Senator on appointment, and each new Member on election, telling him of our services, including samples of our book lists, and our booklet *THIS IS YOUR LIBRARY/VOICI VOTRE BIBLIOTHEQUE*. Last year, for the first time, we obtained invitations to visit party caucuses and outline our services. This has proved to be the most effective means yet found of establishing contact with both new and experienced Members.

The programme of offering written research assistance to Parliamentarians has been the most significant improvement of service inaugurated since 1960, and was* made possible by the complete freedom of the Parliamentary Librarian in preparing his budget for consideration by the Speakers.

2.2.f. RESPONSIBILITIES AND POWERS IN RELATION TO
ACTIVITIES AND PROGRAMMES continued-

Additional activities undertaken since 1960:
the vertical file and clipping service; indexing
of both Senate and House of Commons Committee
Proceedings and Reports, Bills, and Ministers'
speeches (when received); more frequent selected
bibliographies; monthly abstracts of periodical
articles during the session.

The preparation of Parliament's Centennial Project,
compilation in English and in French of a Hansard for
both Houses from 1867 to 1874, the first volumes of
which were recently presented to the Governor General,
represents another programme underway.

In addition, the acknowledged expertise of certain
staff members, particularly in the Research Branch, has
made it possible for the staff to offer increased verbal
counsel to Parliamentarians.

2.2.g. MAJOR HINDRANCES TO EFFECTIVE PERFORMANCE

"The major hindrances to the effective performance" of
our "functions", the honouring of" our "responsibilities
and powers" have been, are, and may continue to be:

2.2.g.

MAJOR HINDRANCES TO EFFECTIVE PERFORMANCE
continued-

- lack of adequate, convenient space;
- lack of adequate, expert staff;
- lack of effective policy-making machinery.

In the matter of space (an historic struggle) the only long-term, obvious solution is to build office space on a site overlapping that of the old Supreme Court Building (now two parking lots), or South of Wellington Street (expropriation eventually, why not now?), or on the river bank (an unsightly despoiling of the setting). That more space is needed to enable Parliament to function properly is beyond dispute; that it must be convenient is equally obvious. The need for scientific and other information is urgent and is required in convenient, non-"departmental" hours. For this our Library location is ideal, but we need more space for research officers, librarians and clerks, and were only able to obtain temporary space at 10 Metcalfe Street following a personal appeal to the then Minister of Public Works. The South side of Wellington Street between Metcalfe and O'Connor streets should be purchased, and a new Parliamentary office building erected to ensure planned space for all Parliamentary services including the Library.

2.2.g.

MAJOR HINDRANCES TO EFFECTIVE PERFORMANCE
continued-

Regarding staff, once we have adequate, convenient space, a major recruiting drive should be undertaken to provide even more expert staff; reference librarians with subject specialities and research officers of graduate faculty calibre. This means higher salaries for the people required. For example, the Chief of our Research Branch, an acknowledged authority on Parliament, co-author of *AN ENCYCLOPAEDIA OF PARLIAMENT* and author of *THE OFFICE OF SPEAKER* has a top salary of only \$14,600.

Our present staff is surprisingly capable, qualified, hard-working, and loyal, for what they are paid, but we need to attract in addition people who can (and have) undertaken original research. We are altogether too dependent on the research of others at present.

Additionally, if this Library is to serve Parliament in the most effective way, it is necessary that a small corps of experts on automation be added to improve library performance, maintain contact with other automated sources of information, and to advise both Houses in this area. Computer expertise is needed on Parliament Hill, and the logical place for it is in the only central, jointly controlled agency, the Library.

2.2.g.

MAJOR HINDRANCES TO EFFECTIVE PERFORMANCE
continued-

Regarding effective policy-making, careful consideration should be given to the recommendations of the 1964 *ORGANIZATION STUDY OF THE LIBRARY OF PARLIAMENT* regarding the establishment of a Policy Committee on Information Services "to be composed of the Chairman of the Internal Economy Committee of the Senate, the Speaker of the House of Commons and the Parliamentary Librarian, to be chaired by the Speaker of the House of Commons". (Appendix 3, #3). The recommendation "that a Management Committee on Information Services be established, to be composed of the Clerk of the Senate, the Clerk of the House of Commons and the Parliamentary Librarian, to be chaired by the Parliamentary Librarian".. also deserves careful examination. (Appendix 3, #4).

The body of the organization report explains that the Policy Committee on Information Services "would concern itself with the organizational location of those functions in which the services of the two Houses, on the one hand, and the Library of Parliament, on the other, now have a common interest. These would include the

2.2.g.

MAJOR HINDRANCES TO EFFECTIVE PERFORMANCE
continued-

indexing of Debates, Journals, Committee Reports and Committee Minutes, the provision of research assistance, the provision of reading room facilities and the extension of the clipping service."

The proposed Management Committee on Information Services "would direct the fact-finding required to assist the Policy Committee, would make recommendations to it and would direct the implementation of policy decisions."

To help ensure that all three "departments" on Parliament Hill advance equally and knowledgeably in the "utilization" of "recent scientific and technical developments" for scientific (and other) information services, improved co-operation is needed and these two proposed committees or similar ones might prove the answer.

In order to carry out the policies decided upon, administrative efficiency would be improved (especially as the staff expands and quick action becomes more necessary to secure scarce subject-trained librarians and faculty-type research officers) if recommendation #12

2.2.g. MAJOR HINDRANCES TO EFFECTIVE PERFORMANCE
continued-

of the *ORGANIZATION STUDY OF THE LIBRARY OF PARLIAMENT 1964* were accepted. (Appendix 3, #12). It reads "That appointments to staff the Library of Parliament be delegated, both in form and in substance, to the Parliamentary Librarian" because (page 23) "the Parliamentary Librarian is a deputy head and as such should have control...".

2.2.h. CHANGES IN ORGANIZATIONAL FUNCTION

The major change in "organization function" recently forecast is the tentative agreement of both Speakers to staff the Library of Parliament, if necessary, with one Research Officer for each committee of the Senate and the House of Commons requiring one in addition to the thirty-five "free" research officers already approved. In short, if the need seems justified, there might within five years be an establishment of some sixty research officers and thirty secretaries to serve Parliamentarians. (At present, March 3, 1969, we have 11 research officers and 5 secretaries in our Research Branch).

2.2.h.

CHANGES IN ORGANIZATIONAL FUNCTION
continued-

Additionally, or in conjunction with this, extra funds should be provided for outside researchers or contract research (when required) as it is obviously cheaper to hire seldom-used specialists for short-term assignments than to have them on full-time duty.

Another most desirable change would be the organization of the systematic dissemination of information to individual Parliamentarians who have clearly stated their needs. This would consist of the rapid provision of accurate abstracts of articles, theses, books, etc., available in the Library, and would be prepared by the Reference Branch. Careful selection would have to be made here, of course, for it is now generally realized that the problem is not often insufficient information, but too much irrelevant information. The principle was approved, however, when, in our budget for 1965-1966, provision was made for two abstractors, but these became research officers in 1967, as pressure on the Research Branch increased.

Automation, must, of course, be carefully considered, and it is hoped that when the need is clearly identified, the small, but highly trained staff required will be forthcoming, and training provided for all others involved.

2.2.h. CHANGES IN ORGANIZATIONAL FUNCTION
continued-

Certainly, the Library of Parliament must use science for the benefit of those we serve.

2.3 PERSONNEL POLICIES

2.3.a. UNIVERSITY RECRUITMENT

1. LIBRARIANS

The Library endeavours to maintain close contact with Canadian Schools of Librarianship. Since there are few schools in Canada and the total number of librarians is not large, it is still possible, through active participation in librarians' organizations and attendance at meetings and conferences, to maintain personal contacts helpful in assessing prospective employees. Since the Library accepts students from Schools of Librarianship for periods of practice work, it is also possible, by this means, to contact and evaluate prospective employees. Furthermore, a number of our staff have lectured both regularly or occasionally at most of the Canadian Schools of Librarianship.

2.3.a. UNIVERSITY RECRUITMENT
continued-

2. RESEARCH OFFICERS have so far been obtained by direct advertising through the Public Service Commission and newspapers, and by unsolicited inquiries or applications to staff members, Parliamentarians, academic friends, the Public Service, or in some cases, by direct approach. If any large expansion is undertaken, recruiting visits to universities would likely be increased.

2.3.b. CRITERIA FOR PREDICTION OF RESEARCH ABILITY

So far, fortunately, all but two of our research officers have had previous related experience.

2.3.c. POTENTIAL AS REFERENCE/RESEARCH ADMINISTRATORS

Performance of new staff members is scrutinized and graded as to originality, work organization, thoroughness, comprehension of objectives, initiative and resourcefulness. Knowledge of work and the ways in which the employee increases knowledge are also considered.

2.3.c. POTENTIAL AS REFERENCE/RESEARCH ADMINISTRATORS
continued-

New professional librarians are given an opportunity to supervise one or more clerical employees in specific areas or tasks, and their responsibilities increase gradually as they become more experienced and demonstrate their ability and interest.

2.3.d. RESEARCH/REFERENCE ADMINISTRATORS and
RESEARCHERS/LIBRARIANS

The increasing depth and complexity of the inquiries being received makes it necessary that the professional staff be more specialized. The Research Branch will be employing an increasing number of subject specialists, and the librarians recruited for the Reference Branch should have useful subject specialization in addition to their training as librarians in order that they may provide adequate information and be able to select new materials to be added to the Library's collection.

At present all senior staff have some administrative responsibility, but as the staff expands it should be possible to pay deserving researchers or specialist

2.3.d. RESEARCH/REFERENCE ADMINISTRATORS and
RESEARCHERS/LIBRARIANS continued-

librarians salaries equal to those who are research/reference administrators. On Parliament Hill it is not necessary to be an administrator to be well-paid.

2.3.e. INTRAMURAL AND EXTRAMURAL EDUCATION
AND TRAINING

The Policy of the Library follows that of the federal government. Educational leave and monetary assistance are provided on the basis of past performance and possible capability, and in accord with the regulations of the Public Service Commission, to professional and other staff members who request them.

Staff members are able to participate in Public Service Commission and other programmes relating to management, finance, developments in automation and data processing, language courses, and speed reading.

In addition, professional staff members also attend seminars, workshops, and conferences held under the auspices of professional associations or universities.

2.3.e.

INTRAMURAL AND EXTRAMURAL EDUCATION
AND TRAINING continued-

Conference participation provides a valuable means for exchanging information, learning new developments, and establishing and maintaining contact with others of the same or related professions. Active participation in professional and library organizations is encouraged, and attendance at meetings is arranged whenever reasonable. Conference attendance expenses will be found listed in Table 2.8.4. (page 55)

An important informal means of extramural education for the librarian consists of working visits to other libraries with similar interests. Some of these are enumerated under 2.8.4., and expenses in Table 2.8.4. (page 55)

Insofar as non-professional staff are concerned, those who successfully complete evening courses which further their general education or improve a particular competence, receive partial reimbursement of tuition (T.B. Minute 620135).

Special Committee

2.3.e. INTRAMURAL AND EXTRAMURAL EDUCATION
AND TRAINING continued -LANGUAGE COURSES
STAFF MEMBERS ATTENDING PUBLIC SERVICE COMMISSION
LANGUAGE COURSES (Beginning in February, 1965)

1964/65 - 2

1965/66 - 2

1966/67 - 4

1967/68 - 7

1968/69 - 11

In some cases attendance was for only part of the year,
and types of courses varied (1-hour per day; 2-½ days per
week; 3-week immersion course). In a number of cases
staff members attended partly on their free time.

2.5 PERSONNEL ASSOCIATED WITH LIBRARY OF
PARLIAMENT INFORMATION ACTIVITIES
(As of December 1, 1968)2.5.a. CURRENT PERSONNEL ESTABLISHMENT: NUMBER OF PEOPLE ON STRENGTH
IN BRACKETS

	<u>Scientific & Professional</u>	<u>Administrative Support</u>	<u>Operational</u>
Cataloguing Branch	7 (7)	10 (10)	
Reference Branch	10 (10)	23 (22)	4 (3)
Research Branch	11 (11)	5 (6) ^{1/}	

1/ One secretary on strength in the Research Branch
is occupying a position on the establishment of
the Reference Branch until March 31, 1969.

2.5.b. . PROFESSIONAL STAFF ON ADMINISTRATIVE DUTIES

1½

This figure assumes that the heads of the Cataloguing, Reference, and Research Branches each spend approximately one-half time on administrative duties. It does not, obviously, take into account the Parliamentary Librarian, Associate Parliamentary Librarian, Assistant Librarian or Library Administrative Officer.

TABLE 2.5.c
PROFESSIONAL STAFF OF THE LIBRARY OF PARLIAMENT
AS OF DECEMBER 1, 1968

2.5.c

	No. of Professional Staff	Country of Birth	Secondary Education	University Education
Bachelor	16	Canada China Czechoslovakia	14 1 1	14 1 1
Master	11	Canada Great Britain	Canada Great Britain Czechoslovakia	Canada Great Britain & Canada
Doctorate	1	Morocco	Morocco	Morocco, France & Canada

TABLE 2.5.c (Cont'd)

PROFESSIONAL STAFF OF THE LIBRARY OF PARLIAMENT

AS OF DECEMBER 1, 1968

2.5.c

	No. of Professional Staff	Years Working as a Professional		Years Employed at the Library of Parliament as a Professional		Average Age	Bilingual
		6	0-5 Yrs. 6-10 " " " "	11	0-5 Yrs. 6-10 " " " "		
Bachelor	16	4	3	2	1	42	51%
		1	16-20 " "	1	16-20 " "		
		1	21-25 " "	1	21-25 " "		
		1	31-35 " "				
Master	11	2	0-5 Yrs. 6-10 " " " "	7	0-5 Yrs. 6-10 " " " "	43.9	64%
		1	11-15 " "	3	11-15 " "		
		3	16-20 " "				
		1	20-25 " "	1	20-25 " "		
		2	26-30 " "				
Doctorate	1	1	19 Yrs.	1	3 Yrs.	44	100%

Special Committee

TABLE 2.5.d

2.5.d

PROFESSIONAL STAFF - LIBRARY OF PARLIAMENT

AS OF MARCH 31 *

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Bachelor	10	9	11	10	14	14	13
Master	4	4	5	5	8	9	11
Doctorate	0	0	0	0	1	1	1

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Bachelor	17	17	17	17	17
Master	13	16	19	22	24
Doctorate	2	2	2	3	3

N.B.: It is obviously impossible to forecast the increase accurately because no firm decision has yet been made regarding the provision of research assistance to Parliamentary Committees.

* Table prepared as of December 1, 1968.

2.5.e.

PERCENTAGE OF TURNOVER OF PROFESSIONAL STAFF
IN EACH OF DEGREE CATEGORIES:

	<u>Bachelor</u>	<u>Master</u>	<u>Doctorate</u>
1962/63	10%	0	N/A
1963/64	30%	0	N/A
1964/65	13.6%	0	N/A
1965/66	3.6%	0	0
1966/67	21.4%	0	0
1967/68	13.3%	0	0

2.5.f.

PERCENTAGE OF PROFESSIONAL STAFF EMPLOYED
AT ONE TIME IN:

I.	Industry	17.9%
II.	Universities	14.3%
III.	Provincial Agency	0
IV.	Other federal Agency	42.9%

Special Committee

2.6. EXPENDITURES ASSOCIATED WITH
SCIENTIFIC ACTIVITIES

2.6.a. TOTAL FUNDS BY FUNCTION, DISCIPLINE AND
AREA OF APPLICATION

The only function in which the Library of Parliament spends a measurable proportion of its funds is that of scientific information.

It is not practicable to break down the total expenditures on a scientific discipline basis. Disciplines of primary interest are economics, political science, and sociology. Those of secondary but increasing interest are the agricultural sciences, engineering and technology.

Similarly, no financial breakdown on the basis of area of application has been attempted since the Library's prime objective is to provide information to Parliament, and other areas are of secondary and minor importance.

In fact, all but a negligible percentage of the Library's operating funds are expended on "scientific" activities.

2.6.b. OPERATING AND CAPITAL EXPENDITURES BY UNITS

Table 2.6.b.^{1/} gives the operating expenditures of each of the three Branches engaged in the area of information. These expenditures and projected estimates of expenditures

TABLE 2.6.b.

2.6.b

LIBRARY OF PARLIAMENT

4/ OPERATING FUNDS & ESTIMATES EXPENDED BY:

	1/ CATALOGUING BRANCH (Salaries only)	REFERENCE BRANCH (Salaries only)	RESEARCH BRANCH (Salaries only)	EXPENDITURES FOR RESEARCH MATERIALS i.e. Books, Periodicals, Microfilms, etc.
1962/63	\$101,299	\$115,702	N/A	\$ 64,577
1963/64	90,343	122,190	N/A	60,880
1964/65	92,147	150,248	N/A	63,966
1965/66	98,564	170,050	\$ 30,958	64,637
1966/67	117,413	196,815	75,933	73,444
1967/68	131,007	208,091	96,716	74,854
1968/69	138,815	233,721	135,560	2/ 82,000
1969/70	147,000	248,000	169,000	86,000
1970/71	156,000	263,000	206,000	90,000
1971/72	165,000	279,000	243,000	94,000
1972/73	175,000	296,000	280,000	98,000
1973/74	185,000	314,000	317,000	100,000

1/ Cataloguing Branch (salaries) includes also salaries of Bindery employees.
2/ Estimate.

3/ Figures beginning with 1969/70 are estimates. Salary figures have been estimated on the basis of a 6% annual increase to cover increments, promotions, and general salary increases. It has been assumed that expansion in number of professional personnel will be confined to the Research Branch.

4/ These figures do not include the salaries of the Parliamentary Librarian, Associate Parliamentary Librarian, Assistant Librarian, and their secretaries, nor the salaries of persons employed in the Library's Administrative Section.

2.6.b.

OPERATING AND CAPITAL EXPENDITURES
BY UNITS continued-

do not include the expenditures for accommodation, furniture, office supplies and stationery, but do include professional and supporting staff, and the materials of research. Expenditures are for all information activities, not merely those connected with scientific information since, as indicated earlier, these constitute a rapidly increasing sector of the work and the research materials. In 1966, for example, it was estimated that approximately one-quarter of the Library's total collection was in the fields of economics, political science, pure science, and technology. However, purchases in these fields are increasing steadily while purchases of literature, religion, and philosophy are decreasing. At the same time older and less-used material in these latter fields is being withdrawn and given to the National Library. The proportion of the total budget spent on periodicals of scientific interest has grown from less than one-fifth to somewhat more than one-third during the last five years.

Although not feasible to indicate by a financial breakdown, the Library in several ways supports higher education in Canada, particularly in political science. The Library's

2.6.b. OPERATING AND CAPITAL EXPENDITURES
BY UNITS continued-

resources are made available for consultation to students and scholars, and material from the collection is available through inter-library loan to other libraries.

In 1966, a total of 573 volumes were lent to other libraries; in 1967, 545 volumes; in 1968, 365 volumes.

The Library has also made and continues to make a substantial contribution to the building up of research collections of Canadian parliamentary papers in the newer universities. We provide material from a large duplicate collection. During 1966, 970 volumes were provided in this way; during 1967, 1,430 volumes; during 1968, 757 volumes.

Some assistance has been provided also to under-developed areas, particularly in the field of library science. During 1966-67, the Parliamentary Librarian of Ceylon gained practical half-time experience in the Library while studying librarianship at the University of Ottawa. Now, one of our Reference Librarians, experienced in government documents, is spending a year at the Library of the University of the West Indies in Jamaica helping to organize their documents collection. Although difficult to quantify, these various services are valuable to other organizations and countries.

2.6.c. FUNDS EXPENDED TO FURTHER PROFESSIONAL UNIVERSITY
EDUCATION OF STAFF

Table 2.6.c. shows the funds expended to cover
further professional university education of staff.

See also 2.3.c.

TABLE 2.6.c.

Funds Expended on University Education of Staff

1966/67	\$3,535.00
1967/68	268.00
1968/69	112.00

2.7 RESEARCH POLICIES

2.7.a. UNITS CONCERNED WITH INTRAMURAL RESEARCH ACTIVITIES

1. As already indicated, the Library of Parliament has one basic programme - that of obtaining, organizing, retrieving, and (when necessary) re-working the information required and requested by Parliamentarians. The three Branches directly contributing to this programme engage in projects, some long-term and repetitive, others short-term. Although some selection takes place, projects are primarily initiated by the Library's users or dictated by the necessity to obtain, organize and make optimum use of the Library's resources.

2. Priorities are based on the day-to-day requirements of the Library's users, but requirements vary greatly and unpredictably, and priorities must be flexible enough to allow alteration and modification in response to the

2.7.a.

UNITS CONCERNED WITH INTRAMURAL RESEARCH ACTIVITIES2. Priorities continued-

pressure of demand. Frequently, also, a project will have a very definite time allowance for its completion, and the production aim has to be realistically related to the time available. Certain continuing projects necessary to maintaining the library's effectiveness can be delayed or temporarily suspended while staff work on urgent requests, but these projects cannot be abandoned entirely. For example, the library's book collection requires systematic examination to ensure that older, little-used material is withdrawn to make space for current purchases. At present staff levels, little of this can now be done during parliamentary sessions. Generally speaking, whenever a new continuing project is being selected, it is necessary to consider the greatest number of users, the known need, and its likelihood of improving staff effectiveness. It is necessary also to determine if there are better services obtainable elsewhere more reasonably and more quickly. There is no point in setting up indexing, abstracting, or current awareness services which are satisfactorily available from commercial or other sources.

2.8RESEARCH OUTPUT

The greater part of the "output" of the three Branches of the Library engaged in "scientific" activities does not lend itself readily to direct measurement.

Quantitative measurement of the output of the Cataloguing Branch, for example, is through the compilation of statistics indicating number of books catalogued and -classified, cards prepared and filed. Unfortunately, this is no real indication of effective performance as the effectiveness of the Catalogue can only be measured by its directing researchers quickly to the material they require.

Similarly, a large proportion of the "output" of the Reference Branch is ephemeral in nature, consisting of answers to specific inquiries, provided verbally or by the provision of printed source material. However, a number of special bibliographies of continuing use internally and to other libraries have been prepared, and a list of the more important appears in Table 2.8.8.^{1/} Table 2.8.8. also lists some reference compilations which are of continuing use to researchers.

Of the queries received by the Reference Branch during November, 1968, over 80% of those requiring considerable

1/ pages 56-57

2.8 RESEARCH OUTPUT continued -

research were in economics, political science or science and technology, while from 50% - 60% of the shorter, information-type queries belonged to these fields. At least 90% of the inquiries received by the rapidly expanding Vertical File and Clipping Service are estimated to be of a "scientific" nature.

2.8.2 BOOKS OR JOURNAL ARTICLES ARISING FROM RESEARCH ACTIVITIES

Canada. Library of Parliament. Research Branch. *THE CANADIAN WHEAT BOARD: ORDERLY MARKETING OF CANADIAN GRAIN*. Printed in the Minutes of Proceedings and Evidence of the House of Commons Standing Committee on Agriculture, Forestry and Rural Development, No. 27, Appendix 1, 1st Session, 27th Parliament, Feb. 5, 1967. p. 1034-1037.

Canada. Library of Parliament. Research Branch. *CRIMINAL INSANITY (FROM M'NAGHTEN TO DURHAM)*. Printed in the Minutes of Proceedings and Evidence of the House of Commons Standing Committee on Justice and Legal Affairs, No. 19, Appendix 12, 1st Session, 27th Parliament, Nov. 29, 1966. p. 673-687.

Canada. Library of Parliament. Research Branch. *GOD SAVE THE QUEEN*. Paper prepared by the Research Branch and presented by the Parliamentary Librarian before the Special Joint Committee of the Senate and the House of Commons on the National and Royal Anthems, March 2, 1967. No. 1, 2nd Session, 27th Parliament, June 8 and October 5, 1967. p. 11-16.

2.8.2. BOOKS OR JOURNAL ARTICLES ARISING FROM
RESEARCH ACTIVITIES continued -

IMMARGEON, H. *LA RESPONSABILITE EXTRA-CONTRACTUELLE DE LA COURONNE AU CANADA** Montréal, Wilson & Lafleur, 1965. (forthcoming publications include a chapter dealing with liability 'in tort' in *DROIT ADMINISTRATIF CANADIEN ET QUEBECOIS*, and a chapter *LES FRONTIERES DE LA PROVINCE DE QUEBEC* to be included in a book sponsored by the University of Montreal's Institute of Public Law).

LAUNDY, P. A. C. *ENCYCLOPAEDIA OF PARLIAMENT** (in collaboration with Norman Wilding). 3d rev. ed., N.Y., Praeger, 1968. 912 p.

LAUNDY, P. A. C. *THE OFFICE OF SPEAKER** London, Cassell, 1964. 488 p.

LAUNDY, P. A. C. Canada's Speakership Attains Independence. *THE PARLIAMENTARIAN* 49:12-15 Jan. 1969.

LAUNDY, P. A. C. Procedural Reform in the Canadian House of Commons. *THE TABLE* 34:20-30 1965.

LAUNDY, P. A. C. Procedural Reform in the Canadian House of Commons. *CONSTITUTIONAL AND PARLIAMENTARY INFORMATION* 3rd ser. 49-62 Apr. 1966.

SPICER, E. J. Report to C.L.A. On Need For Professional Librarians 1962-1967/Rapport présenté à l'A.C.B. sur le besoin de bibliothécaires au Canada. *CANADIAN LIBRARY* 17:158-165 Jan. 1964.

* The "research activities" leading to these publications were personal, of course, and preceded appointment to the Library of Parliament staff.

TABLE 2.8.3.

LIBRARY OF PARLIAMENT - RESEARCH BRANCH

SUBJECT ANALYSIS OF PAPERS PREPARED

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Agriculture		2	5	6
Civil Law		8		3
Constitutional Law		3	18	11
Economics	1	33	21	34
Education	3	1	3	2
External Affairs		5	12	7
General	5	12	22	20
Health		6	3	5
History		2	13	2
Other Legal projects		31	27	14
Parliamentary Procedure	7	22	22	22
Political Science	7	25	19	29
Public Administration		28	16	3
Science				7
Science Policy		6	6	1
Social Science		4	13	10
Technology	3	1		
	<u>26</u>	<u>189</u>	<u>200</u>	<u>176</u>

EXAMPLES OF PAPERS PREPARED BY RESEARCH BRANCH

Water Pollution Control: Summary of Current Federal &
 Provincial Programmes
 Development of Nuclear Power in Canada
 Health Insurance in Canada
 Abortion
 Homosexuality
 State Lotteries

2.8.3 REPORTS

Table 2.8.3 indicates by subject area, the research papers prepared during the years 1965-68 by the staff of the Research Branch. In the same table will be found a listing by title of some of the more widely used research papers. (page 53)

2.8.4 CONFERENCES

Participation in seminars and study groups at Conferences is an important way in which professional personnel may learn of recent developments in their professions and exchange ideas with their fellows. A related manner for

.8.4. CONFERENCES continued

informal education of professional staff is by visits (exchange or one way) to institutions engaged in similar activities. During the past five years these include the Library of Congress, Washington, the libraries of the House of Commons and House of Lords, London, the libraries of the Senate and Chamber of Deputies, Paris, and the provincial legislative libraries in Canada. (See also 2.3.e.)

Table 2.8.4. indicates the expenses on conference participation, and in working visits to other libraries during the current and preceding five fiscal years.

TABLE 2.8.4.

MONEY EXPENDED ON CONFERENCE PARTICIPATION
AND VISITS TO OTHER LIBRARIES

1963-64	\$ 707.27
1964-65	\$1,110.90
1965-66	\$1,403.62
1966-67	\$1,542.70
1967-68	\$ 816.08
1968-69	\$1,315.21*

* to February 15, 1969

2.8.8.

TABLE 2.8.8.

LIBRARY OF PARLIAMENT - REFERENCE BRANCHSPECIAL BIBLIOGRAPHIES

- 1962 - Oct. *BACKGROUND TO PARLIAMENT/LE DOMAINE PARLEMENTAIRE.* 17 p.
- 1963 - Aug. *CANADIAN DUALISM/LA DUALITÉ CANADIENNE* 3 p.
- Nov. *SELECT BIBLIOGRAPHY ON PROCEDURE/ SÉLECTION BIBLIOGRAPHIQUE SUR PROCÉDURE.* 7 p.
- 1965 - Feb. *HEALTH INSURANCE/ASSURANCE-SANTÉ.* 14 p.
- Mar. *CAPITAL PUNISHMENT/LA PEINE DE MORT.* 10 p.
(also published in Canada. Dept. Justice.
CAPITAL PUNISHMENT: MATERIAL RELATING TO ITS PURPOSE AND VALUE. 1965. p. 136-141.)
- May *SELECT BIBLIOGRAPHY ON PARLIAMENTARY PROCEDURE/ BIBLIOGRAPHIE SÉLECTIVE SUR LA PROCÉDURE PARLEMENTAIRE.* 29 p.
- Oct. *CANADIAN BOOKS, PAMPHLETS AND DOCUMENTS ON GERONTOLOGY/OUVRAGES CANADIENS SUR LA GÉRONTOLOGIE.*
(This appeared also as part of Canadian Library Association Occasional Paper No. 64)
- 1966 - Mar. *BACKGROUND TO PARLIAMENT/LE DOMAINE PARLEMENTAIRE.* 35 p.
- Mar. *CAPITAL PUNISHMENT (Supplement) / LA PEINE DE MORT (Supplément)* 3 p.
- Oct. *INFLATION* 5 p.
- 1967 - Mar. *ELECTIONS.* 27 p.
- Apr. *CRIME AND CRIMINAL JUSTICE/CRIME ET JUSTICE.* 25 p.
- July *THE CABINET MINISTER AND ADMINISTRATION.* 5 p.

2.8.8.

TABLE 2.8.8.LIBRARY OF PARLIAMENT - REFERENCE BRANCHSPECIAL BIBLIOGRAPHIES continued-

- 1967 - Sept. *CONSUMERS AND CONSUMER PROBLEMS/LE CONSOMMATEUR ET SES PROBLEMES.* 23 p.
- 1968 - Jan. *THE SENATE OF CANADA/LE SENAT DU CANADA.* 5 p.
- Aug. *PARLIAMENT IN A MODERN WORLD/LE PARLEMENT DANS LE MONDE MODERNE.* 13 p.
- Oct. *THE SUPREME COURT OF CANADA.* 5 p.
- Nov. *PARLIAMENTARY CONTROL OF THE PUBLIC PURSE/LE CONTROLE PARLEMENTAIRE DES FINANCES PUBLIQUES.* 7 p.
- Dec. *PRIME MINISTERS AND CABINET MINISTERS 1867-1968 - BIOGRAPHIES AND AUTOBIOGRAPHIES.* 95 p.

SPECIAL COMPILATIONS

- CANADA. LIBRARY OF PARLIAMENT. *CABINET APPOINTMENTS TO NON-MEMBERS OF THE HOUSE OF COMMONS, 1867-1966.* (OTTAWA, 1966) 4 leaves.
- . --. *CANADIAN WOMEN IN PARLIAMENT.* (Ottawa, 1967) 7 leaves. (Names, constituencies, years of office).
- . --. *NAMES OF SENATORS APPOINTED TO THE SENATE OF CANADA AT AGE 40 OR UNDER - FROM 1867-1968.*
- . --. *NAMES OF SENATORS APPOINTED TO THE SENATE OF CANADA AGED FROM 41 to 50 - FROM 1867-1968.*
- . --. *O CANADA.* (Evidence relating to the usage and history of the music and words presented by the Associate Parliamentary Librarian to the Special Joint Committee of the Senate and the House of Commons on the National and Royal Anthems, March 2, 1967. pp. 1-10).
- . --. *OCCUPATIONS OF MEMBERS OF THE HOUSE OF COMMONS, 1867-1968.* (Tabulated by Parliaments).
- . --. *PUBLIC AND PRIVATE BILLS INTRODUCED IN THE HOUSE OF COMMONS, AND PUBLIC AND PRIVATE ACTS GIVEN ROYAL ASSENT (excluding divorce), 1867-1967.* (Ottawa, 1967) 4 leaves.
- . --. *SELECTED READING LISTS RELATED TO TOPICS ON THE AGENDA OF THE COMMONWEALTH PARLIAMENTARY CONFERENCE.* (Held annually. Reference Branch prepared lists for some conferences; the Research Branch for others.)

2.9 PROJECTS

2.9.1. The titles or brief descriptions of projects requested in this section have already been largely given in Tables 2.8.2., 2.8.3., and 2.8.8. It seems redundant to repeat them here.

Briefly, however, the Cataloguing Branch main project of cataloguing has continued, and from 1962 to 1967, inclusive, some 88,370 books, periodicals, and other items have been processed, some 564,220 cards added to the separate French and English catalogues.

The work of the Reference Branch has been shown sufficiently, and it would obviously be onerous to list the questions asked and answers given.

The work of the Research Branch is, of course, like that of the Reference Branch, almost entirely confidential, but elaboration is given in 2.9.2.

2.9.2. SELECTED SPECIAL PROJECTS OF THE RESEARCH BRANCH

Perhaps the "most significant" though necessarily uncompleted project of the last five years concerns work on parliamentary procedure, and work with Parliamentary Associations.

2.9.2.

SELECTED SPECIAL PROJECTS OF THE RESEARCH BRANCH
continued-

1. WORK WITH HOUSE OF COMMONS COMMITTEES
ON PROCEDURE

The Chief of the Research Branch has assisted various Procedure Committees in a secretarial and advisory capacity since 1964.

In the Second Session of the 26th Parliament (1964 to 1965), he was attached to the Special Committee on Procedure and Organization whose recommendations gave rise to a number of procedural changes on a provisional basis.

In the Second Session of the 27th Parliament (1966 to 1967), he was attached to the Special Committee on Procedures of the House. This Committee was re-established in the Third Session of the same Parliament (1967 to 1968), and the Chief of the Research Branch accompanied the Committee on a visit to London, England, in February, 1968, which was made for the purpose of studying the procedures of the House of Commons at Westminster.

During the First Session of the 28th Parliament, he assisted the Special Committee on Procedure of the House which submitted reports in December, 1968, which led to the adoption on a permanent basis of far-reaching procedural changes

2.9.2. SELECTED SPECIAL PROJECTS OF THE RESEARCH BRANCH
1. Work With House of Commons Committees on
Procedure continued -

by the House of Commons. The reports of this Committee reflected the experience gained by the previous Committee during the Westminster visit.

This continuing project relating to the Reform of Parliamentary Procedures is an example of the substantial results to which the work of the Research Branch may lead.

2. WORK WITH PARLIAMENTARY ASSOCIATIONS

Since the establishment of the Research Branch, the service to both Houses of Parliament has included assistance to delegations attending international and national Parliamentary conferences. This assistance has taken two distinct forms: the preparation of research papers relating to the various items on the agenda of such conferences; direct participation on the part of research officers in Parliamentary delegations in a secretarial and advisory capacity.

For example:

During the 12th Conference of the Commonwealth Parliamentary Association, Ottawa, September, 1966, the Chief of the Research Branch acted as Secretary to a

2.9.2.

SELECTED SPECIAL PROJECTS OF THE RESEARCH BRANCH2. Work With Parliamentary Associations continued-

Conference of Commonwealth Speakers and presiding officers, and prepared the report arising from that conference.

In April, 1967, he attended the Spring meeting of the Inter-Parliamentary Union in Majorca and assisted the Canadian delegation in a secretarial capacity. On his return to Ottawa, he reported to the Speaker of the House of Commons on the results of the Conference.

In July, 1968, he attended the Canadian Area Council Meeting of the Commonwealth Parliamentary Association in Ottawa: in September, the subsequent Canadian Area Conference in British Columbia. During these meetings the question of research service to Members of Parliament was one of the main items on the agenda. The Chief of the Research Branch prepared a paper on this subject which was discussed at both conferences. He introduced the paper and answered questions directed to him by delegates. In British Columbia, he also presented a paper on the *REFORM OF FINANCIAL PROCEDURE* and initiated the discussion on this topic.

In December, 1968, the Chief of the Research Branch went to London, England, on behalf of the Speaker of the House of

2.9.2.

SELECTED SPECIAL PROJECTS OF THE RESEARCH BRANCH2. Work With Parliamentary Associations continued-

Commons for discussions at Westminster relating to the forthcoming conference of Commonwealth Speakers and Presiding Officers to be held in Ottawa in September, 1969. The Chief of the Research Branch will be responsible for the secretarial organization of the Conference, and the preparation of the Conference Report.

In addition, a Research Officer acts as secretary to the Canadian Sections of the following two Inter-parliamentary associations: l'Association internationale des Parlementaires de langue française and l'Association interparlementaire Canada-France. Duties involve correspondence, preparation of meetings, and drafting of reports following such meetings.

2.10 THE FUTURE

2.10.1 POSSIBLE EFFECTS OF TECHNOLOGICAL CHANGES likely to affect our "operations, functions, and responsibilities" during the next five years are primarily those directly affecting other sources of information beyond our own collection. For example, if the National Library promptly and effectively catalogues all federal government publications prior to issue (which is possible), and if the same can be done for provincial publications (which is unlikely), then our cataloguing staff may be reduced and the office space thus freed made available to research officers. If cataloguing in advance of publication became general for all publications within ten years, and if other advances are made, then the space made available within the library for research officers could be significant.

Within the next ten years, as more relevant material becomes available in computer banks, through facsimile transfer, and/or through miniaturization, more space should be released for staff rather than books. It may become unnecessary for us to maintain periodical files; articles may be analyzed, abstracted, and placed in a

2.10.1 POSSIBLE EFFECTS OF TECHNOLOGICAL CHANGES
continued-

computer memory when published by a commercial (or government) service, and any required article retrieved here in print-out form.

Generally speaking, the application of computer technology to indexing, abstracting and cataloguing operations should speed up and generally facilitate literature and information searches. Files of Law reports may become unnecessary if they are indexed as issued and stored in a computer installation. This may develop fairly soon as law is a well-defined field with repetitive and time-consuming, but most necessary, searching.

In time, the importance of well-chosen, well-trained staff may increase over the importance of well-chosen, well-organized materials, if instant availability is assured from remote locations.

2.10.2 STUDIES OF POSSIBLE AUTOMATED IMPROVEMENTS

At the next to last meeting of the Joint Committee on the Library of Parliament (November 19, 1968), the Parliamentary Librarian proposed a preliminary study "to determine what system, if any, should be installed to improve the abstracting, indexing, storing, and retrieval

2.10.2 STUDIES OF POSSIBLE AUTOMATED IMPROVEMENTS
continued-

of information, and to provide a rough estimate of the costs of any programme recommended", but this was referred back to him for further information. Final approval to proceed was given by the Joint Committee February 26, 1969, and the survey should be well underway by the time this brief is received.

2.10.3 TECHNICAL/SCIENTIFIC ADVICE SOUGHT DURING
THE LAST FIVE YEARS

Much reading has been done by the Parliamentary Librarian and his staff, meetings have been attended, and short courses on automation have been taken by professional librarians in the Cataloguing and Reference Branches.

One staff member has completed her Master's Degree at the University of Toronto Library School with a thesis entitled *RECORDS AND PROCEDURES IN THE TECHNICAL SERVICES DEPARTMENT OF THE LIBRARY OF PARLIAMENT.*

Discussions were held with Mr. K. J. Radford, then Director of the federal government's Central Data Processing Service Bureau, and also with representatives of the IBM company who kindly arranged two very interesting demonstrations with their SDI system which some staff but few Members of Parliament attended. Some four years were spent working with IBM representatives to prepare a demonstration to be held in the Library, but initial information was incorrect, and the project was suspended early in 1968.

Special Committee

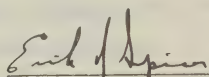
2.10.3 TECHNICAL/SCIENTIFIC ADVICE SOUGHT
DURING THE LAST FIVE YEARS continued-

The Assistant Librarian went to Queen's University, Kingston, for the conference on Computers and the Law in June, 1968, and the Parliamentary Librarian to a Toronto symposium on Microfilm and the Law, November, 1968. The Assistant Librarian also attended a Data Processing Conference in Ottawa, February, 1969.

2.10.4 FUTURE PLANS TO UTILIZE RECENT SCIENTIFIC/
TECHNICAL DEVELOPMENT

Any plans for the future await the preliminary survey of the areas in which automation may usefully be introduced on the Hill, and must not be limited to the Library alone.

It is also hoped that a senior automation expert will be appointed to the Library to help improve its utilization of these methods, its contacts with other automated sources of information, and to serve both Houses in an advisory capacity.


Erik J. Spicer
Parliamentary Librarian

OTTAWA
March 21, 1969.

APPENDIX 1

LIBRARY OF PARLIAMENT

REGULATIONS

Adopted by the Joint Committee on the Library of Parliament December 21, 1967, and approved by the Senate February 14, 1968, and the House of Commons February 16, 1968.

1. The Joint Committee on the Library of Parliament shall meet at the call of the Joint Chairmen at least once in each Session.
2. The Parliamentary Librarian shall report the state of the Library to both Houses, through Mr. Speaker, at the opening of each Session.
3. Persons entitled to borrow books from the Library are the Governor General, Members of the Privy Council, Members of the Senate and of the House of Commons, officers of the two Houses, Justices of the Supreme Court of Canada and of the Exchequer Court, members of the Press Gallery, and other persons in accordance with the written authorization of either Speaker or of the Parliamentary Librarian.
4. The Library of Parliament may lend books to other libraries, and to government agencies, at the discretion of the Parliamentary Librarian.
5. An adult member of the public authorized by a Senator, a Member of the House of Commons, or the Parliamentary Librarian, may consult books and periodicals in the Library, but shall not be allowed to borrow them.
6. Use of the Library's main Reading Room beyond normal working hours may be granted in writing to certain individuals at the discretion of the Parliamentary Librarian.
7. Except with the written approval of either Speaker, or of the Parliamentary Librarian, books of special value may not be removed from the Library.
8. During the Session the Library shall be open as follows:

Mondays, Tuesdays and Thursdays, from 9 in the morning until
the House rises in the evening;
Wednesdays and Fridays, from 9 in the morning until 9 in the
evening;
Saturdays, from 9.30 in the morning until 5 in the afternoon.
When the House sits in the evening on Wednesdays, Fridays or
Saturdays, the Library shall remain open until the House rises.
9. During the Recess of Parliament, the Library shall open, Monday through Friday (holidays excepted), not later than 9.30 in the morning, and shall close not earlier than 4 in the afternoon.
10. The Reading Room of the House of Commons shall be open during the same hours as the Library of Parliament, with the exception that, during the Session, it shall be open on Sundays from 12 to 4 in the afternoon.

Ottawa
December 21, 1967.



CHAPTER 166.

An Act respecting the Library of Parliament.

SHORT TITLE.

1. This Act may be cited as the *Library of Parliament* Short title.
Act. R.S., c. 146, s. 1.

2. All books, paintings, maps, and other effects that are Books, etc., vested in Her Majesty.
 in the joint possession of the Senate and House of Commons of Canada, or are hereafter added to the existing collection, are vested in Her Majesty, for the use of both Houses of Parliament, and shall be kept in a suitable portion of the Parliament buildings appropriated for that purpose. R.S., c. 146, s. 2.

3. The direction and control of the Library of Parliament, and of the officers and servants connected therewith, is vested in the Speaker of the Senate and the Speaker of the House of Commons for the time being, assisted, during each session, by a joint committee to be appointed by the two Houses. Administration. R.S., c. 146, s. 3.

4. The Speakers of the two Houses of Parliament, Regulations.
 assisted by the joint committee, may, from time to time, make such orders and regulations for the government of the Library, and for the proper expenditure of moneys voted by Parliament for the purchase of books, maps or other articles to be deposited therein, as to them seem meet, subject to the approval of the two Houses of Parliament. R.S., c. 146, s. 4.

5. (1) There shall be two librarians, one of whom shall Librarians
 be called the General Librarian and the other of whom shall be called the Parliamentary Librarian, who shall be appointed by joint commission under the Great Seal as Librarians of Parliament to hold office during pleasure.

(2) The librarians each have the rank of a deputy Rank of Librarians.
 head of a department with equal powers as respects the control and management of the Library. R.S., c. 146, s. 5.

2 Chap. 166. *Library of Parliament.*

Officers and
servants,
appoint-
ment of.

6. Such other officers, clerks and servants as are authorized by law and requisite for the service of the Library may be appointed in the manner prescribed by law to hold office during pleasure. R.S., c. 146, s. 6.

Salaries.

7. (1) Each of the librarians shall receive the salary that he is by law authorized to receive.

(2) The salaries of the other officers, clerks and servants of the Library shall be fixed respectively according to the scale therefor by law provided. R.S., c. 146, s. 7.

How paid.

8. The salaries of the officers and servants of the Library of Parliament, and any casual expenses connected therewith, shall be paid out of moneys provided by Parliament for that purpose. R.S., c. 146, s. 8.

Responsi-
bilities of
officers and
servants.

9. The General Librarian, Parliamentary Librarian and other officers and servants of the Library of Parliament are responsible for the faithful discharge of their official duties, as those duties are defined by regulations agreed upon by the Speakers of the two Houses, and concurred in by the said joint committee on the Library. R.S., c. 146, s. 9.

Stationery.

10. The supply of stationery required for the use of the Library shall be furnished by the Department of Public Printing and Stationery, and charged to the Houses of Parliament. R.S., c. 146, s. 10.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1952

3 - 4 ELIZABETH II.

CHAP. 35.

An Act to amend the Library of Parliament Act.

[Assented to 28th June, 1955.]

HER Majesty, by and with the advice and consent of the R.S. c. 100.
 Senate and House of Commons of Canada, enacts as follows:

1. Section 5 of the *Library of Parliament Act*, chapter 166 of the Revised Statutes of Canada, 1952, is repealed and the following substituted therefor:

"5. (1) The Governor in Council may by commission Librarian.
 under the Great Seal appoint a Parliamentary Librarian to hold office during pleasure.

(2) The Parliamentary Librarian has the rank of a deputy Rank and
 head of a department and, subject to section 3, has the con- duties.
 trol and management of the Library.

(3) The Governor in Council may by commission under Associate
 the Great Seal appoint an Associate Parliamentary librarian.
 Librarian to hold office during pleasure who, in addition to any duties defined in respect of his office under section 9, shall execute and perform the duties and functions of Parliamentary Librarian during his absence, illness or other incapacity or during a vacancy in the office of Parliamentary Librarian."

2. Section 9 of the said Act is repealed and the following substituted therefor:

"9. The Parliamentary Librarian, the Associate Parlia- Duties of
 mentary Librarian and the other officers and servants of the librarians
 Library of Parliament are responsible for the faithful and staff.
 discharge of their official duties, as those duties are defined by regulations agreed upon by the Speakers of the two Houses, and concurred in by the joint committee on the Library."

3. Paragraph (c) of subsection (1) of section 2 of the Civil Service
Civil Service Act, chapter 48 of the Revised Statutes of Act.

2 Chap. 35. *Library of Parliament.* 3-4 ELIZ. II.

Canada, 1952, is amended by striking out the expression "Librarians of Parliament" and substituting the expression "Parliamentary Librarian" therefor.

Coming into
force.

4. This Act shall come into force when a vacancy in the office of either the General Librarian or Parliamentary Librarian under the *Library of Parliament Act* first occurs after the passing of this Act, and the General Librarian or Parliamentary Librarian, as the case may be, then in office, shall be deemed to have been appointed Parliamentary Librarian under the *Library of Parliament Act* as amended by this Act.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1956

APPENDIX 3

ORGANIZATION STUDY
OF THE
LIBRARY OF PARLIAMENT

December, 1964

ORGANIZATION DIVISION, ADVISORY SERVICES BRANCH, CIVIL SERVICE COMMISSION

APPENDIX 3 continuedLIST OF RECOMMENDATIONS

	<u>Page</u>
1. That the Speaker of the Senate and the Speaker of the House of Commons continue to act as joint chairmen of the Joint Committee, each with the power to call a meeting on his own initiative.	6
2. That the Speaker of the House of Commons be designated as the executive head to whom the Parliamentary Librarian would report on the implementation of policy and on the administrative decisions taken within the approved budget.	6
3. That a Policy Committee on Information Services be established to be composed of the Chairman of the Internal Economy Committee of the Senate, the Speaker of the House of Commons and the Parliamentary Librarian, to be chaired by the Speaker of the House of Commons.	7
4. That a Management Committee on Information Services be established, to be composed of the Clerk of the Senate, the Clerk of the House of Commons and the Parliamentary Librarian, to be chaired by the Parliamentary Librarian.	7
5. That the proposed Policy Committee on Information Services consider the establishment of a single Reading Room in the Library of Parliament to serve members of both Houses.	9
6. That the proposed Policy Committee on Information Services consider the establishment of a single indexing service so that references to the content of all parliamentary papers will be prepared with equal efficiency for the use of members of the Senate and the House of Commons.	12
7. That negotiations respecting the establishment of a Central Indexing Service take place on the understanding that the unit will be located in a jointly-controlled agency, the Library of Parliament.	13

	<u>Page</u>
8. That if a decision is taken to establish a Central Indexing Service, a study be requested of the Management Analysis Division of the Civil Service Commission to determine the most efficient mechanical processes by which the indexes can be reproduced.	13
9. That the questions of if, how and where research assistance should be provided for members of the two Houses be decided, after due consultation, by the proposed Policy Committee on Information Services, and that these decisions be implemented by the proposed Management Committee on Information Services.	14
10. That the proposed Management Committee on Information Services ascertain the space requirements of the Library of Parliament and make recommendations thereon to the Policy Committee.	22
11. That the Parliamentary Librarian request advice from the Management Analysis Division on procedures for processing newspaper subscriptions and book invoices.	22
12. That appointments to staff the Library of Parliament be delegated, both in form and in substance, to the Parliamentary Librarian.	23

APPENDIX 58

Brief from the Public Archives of Canada
to the Senate Special Committee on Science Policy

Although the Public Archives of Canada is not essentially a research institution its relationship with historical research is so close that it seems worth while to indicate to your Committee the nature of its activities. The major functions of the Public Archives - the acquisition of material which provides the basis for research, the classification and preparation of finding aids which makes it accessible, and the provision of reference services and research facilities - can be considered as essential support for research in history, political science and other disciplines.

Under the Public Archives Act, the Dominion Archivist has the care, custody and control of the Public Archives, which are defined as "public records, documents and other historical material of every kind, nature and description". Actually, the Public Archives has a dual role: 1) as an agency which provides services to the Government of Canada in regard to its own records and 2) as an agency which ensures the preservation of research material and provides reference services and facilities for research. The essential unity of paperwork management - for current and dormant records and archives - is generally recognized. The financial savings which result from the records management programme, including records centres and central microfilm services, offsets the cost of the conventional archival programme which is directly related to research.

The functions of the Public Archives are carried out by three branches. The Administration and Technical Services Branch, in addition to providing for the administrative and material requirements of the department, looks after the preservation, restoration and copying of documents of all kinds in the custody of the Public Archives. It includes a Central Microfilm Unit for the Government of Canada and provides advisory services in regard to microfilm. The Records Management Branch has a wide range of activities which are designed to improve the efficiency and economy of records management in the government under the authority of the Public Records Order of 1966. They include storage and reference services for dormant records in a central and regional records centres, advisory services, training and reports on the adequacy of classification, scheduling and provision for the selection of records which have value for research. The Historical Branch with its four divisions dealing respectively with manuscripts, maps, pictures and printed material provides for the acquisition and selection of documents, arranges and describes them, makes them available to qualified researchers and provides information in response to inquiries directed to the Public Archives. In addition, small offices in London and Paris are engaged in the location, acquisition and copying of archival material relating to Canada in Great Britain and France. Finally, a publication section looks after the publication of inventories, guides and selected documents. The functions of the Historical Branch, the London and Paris offices and the Publication Section

tend to provide researchers with the documentary material relating to Canadian history which they require and the tools (research rooms, finding aids, photoduplication, etc.) which facilitates their work.

At present the budget of the Public Archives is approximately \$2,250,000, of which about \$300,000 is spent for services to the National Library; two-thirds of the remainder is devoted to the archival program and related administrative costs, and one-third to the records management program, including related administrative costs. The total staff of the Public Archives is 278, of whom approximately 50 are classified as Historical Research Officers. About half of them have the degree of B.A. with Honours in History, the remainder hold a licence, M.A. or Ph.D. In recent years increases in staff and budget have been necessary because of

1. Unprecedented increases in research requirements.

Registration of researchers, circulation of material, written inquiries, interlibrary loans of microfilm, orders for photoduplication and other aspects of research have been increasing at a rate of from 15% to 50% annually.

2. Increases in acquisitions. There have been increases in all types of archival material whether of public or private origin. Recent accessions of private papers of Mr. Diefenbaker and Mr. Pearson alone amounted to 2500 cu. ft. The chief increase, however, has been in public records, the result of the development of procedures for scheduling, selection and transfer. The volume of public

records will increase greatly in 1969, since the Public Records Order requires all records to be scheduled by May 1 and a Cabinet decision on access is expected to require most records thirty years or older to be transferred to the Public Archives.

3. A greater variety of materials acquired. Until recently most emphasis was placed on the acquisition of textual materials such as private papers, government files or microfilm copies of material from abroad. Recently the volume of acquisitions of photographs (now nearly 1,000,000 items), maps (now nearly 500,000) has increased and attention is being given now to the development of national collections of motion pictures, sound recordings, architectural drawings and other materials.

Areas of activity which are directly related to research are:

1. Acquisition of material of archival value with a view to providing adequate documentation on all aspects of national development.
 - (a) Public records. With improvements in records management, the authority of the Public Records Order and cooperation with the Treasury Board, procedures for the destruction of useless records and the preservation of records of potential research value is becoming a smoothly functioning operation as far as textual

records are concerned in government departments. There is a need for improvement in two respects: 1) the application of the Public Records Order to crown corporations (at present it is optional) and 2) the application of the scheduling procedure to maps, drawings, photographs, tape records and motion picture films and also to computer products.

- (b) Private records and papers. Since there is no obligation to deposit private papers in the Public Archives they must be sought and acquired by individual negotiations. The Public Archives should acquire material which is of national significance from individuals, associations and corporations. There is increasing competition from university archives and although attempts are being made to define boundaries for archival repositories there is an increasing need for thorough, systematic and intensive searches for original material, for preventing destruction of papers, the erasing of tapes and for intensified activity in oral history.

2. Appraisal and selection. This is an important function of the Public Archives requiring high professional qualifications, broad knowledge, and experience. Archivists cannot be limited by current research trends since their aim is to select material which documents all significant aspects of Canadian life, to anticipate the requirements of

future as well as present researchers. If significant material for research is not saved from destruction there will be permanent gaps in wide areas of knowledge. Successful selection depends upon the employment of a high calibre of archivist and on salary and other elements in a career which will enable the government to retain him and profit from his experience, the continued development of selection standards and an adaptation to technological changes, e.g., it is becoming feasible to retain a larger volume of records in machine readable form than has been possible when the information was on paper. At present there is a large backlog of records requiring additional staff for selection.

3. Arrangement and description. Material which has been selected for permanent retention is only accessible for research purposes after it has been properly classified and described. A variety of finding aids are prepared ranging from brief collective descriptions to detailed lists and indexes. Increasing demands for reference tend to occupy more staff time at the expense of the necessary preparation of finding aids, which are basic research tools. More effective use of the Public Archives for research can be promoted by the preparation of internal finding aids and by the publication of inventories and guides which will inform potential researchers and directors of research concerning the material which is available.

4. Research services and facilities. The research services and facilities provided by the Public Archives of Canada can be compared favorably with those of any similar repository anywhere. Some services are unusual if not unique for national archives - the preservation of material of private origin as well as government records, the 24-hour-a-day access to documents by accredited researchers, interlibrary loans of microfilm, etc. The relationship between professional staff and researcher has been particularly close at the Public Archives and this relationship has extended to professional organizations, particularly the Canadian Historical Association. At present the two Secretaries, the Treasurer and two Editors of the Association are on the staff of the Public Archives while another member is Chairman of the Archives Section of the Association and another prepares the annual Register of Dissertations in History and Related Subjects. It has been necessary to set limits on the length of time spent in answering inquiries, on the amount of photoduplication, etc. The effectiveness of reference services would be greatly improved by the preparation and dissemination of more information in the form of guides and inventories. The relationship of reference and automated information systems has been studied and limited use has been made of automation in the preparation of detailed finding aids. The use of computers for information retrieval does

not seem to be feasible at present. The role of the Public Archives and social science data banks is being examined and it appears that the major role of the Public Archives should be as a source of information found in records and not as a location for a data bank. More widespread use can be made of the documentation at the Public Archives, particularly in the field of education, for example, for educational T.V. programmes and other audio-visual systems.

The following recommendations indicate areas in which the effectiveness of the Public Archives in regard to research can be improved:

1. An increase in staff is required to permit the department to pursue energetically the tasks of acquiring and making available to researchers documentation relating to the development of Canada.
2. A more liberal policy regarding access to public records should be announced without delay.
3. The terms of the Public Records Order of 1966 should be extended to include all types of records for all agencies supported by government funds.
4. A limited number of scholarships should be available for distribution by the Public Archives for pre- or post-doctoral research in administrative history, particularly the preparation of histories of government departments and agencies.

5. Continued cooperation with other government departments and agencies, including crown corporations, should attempt to eliminate duplication of archival functions.
6. Additional funds should be used to disseminate information concerning Canadian history based on documentation in the custody of the Public Archives.

APPENDIX 59

Brief
Presented To
THE SPECIAL COMMITTEE ON SCIENCE POLICY
OF THE SENATE OF CANADA
Prepared By
THE ST. LAWRENCE SEAWAY AUTHORITY
On Request

January 1969

Brief
Presented To
THE SPECIAL COMMITTEE ON SCIENCE POLICY
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Prepared By
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On Request

January 1969

BRIEF TO THE SPECIAL COMMITTEE ON SCIENCE POLICY
OF THE SENATE OF CANADA

This brief on scientific activities of the St. Lawrence Seaway Authority has been prepared for the Special Committee on Science Policy of the Senate of Canada. In the preparation of this brief the sequence of subject matter corresponds to that set out in Part II of the Senate Committee guidelines. The information herein pertains to the St. Lawrence Seaway Authority as a Crown Corporation of the Federal Government of Canada and to the Construction, Economics and Research, and Engineering Branches as units of the Authority. These branches are responsible for scientific activities within the Authority.

1.1 Organization

An organizational block diagram of the St. Lawrence Seaway Authority is included in Appendix 'A' of this report. Each unit conducting or funding scientific activities is indicated with an asterisk.

The St. Lawrence Seaway Authority reports directly to the Minister of Transport and has no formal connection with other Federal agencies.

There are three branches within the Authority involved to some degree in scientific activities. Block diagrams of the organization of Construction, Economics and Research, and Engineering branches are included in this report in appendices 'B', 'C', and 'D' respectively.

The Authority, to date, has not entered into any formal agreements with other foreign governments or their agencies, nor does the Authority maintain overseas offices concerned with scientific activities.

1.2 Organizational Functions

Statutory functions and powers regarding scientific activities within the St. Lawrence Seaway Authority are not formally defined since the involvement in such activities is minimal. As a result, no organizational policies have evolved that could be described as this agency's "science policy".

The Authority has no functions nor responsibilities of a science nature to other Federal agencies, industry, educational institutions, etc.

With respect to outside studies, the firm of Kates, Peat, Marwick & Co. of Toronto, Ontario were commissioned by the St. Lawrence Seaway in 1964 to determine the causes of delays and lengthy average transit times on the Welland Section of the Seaway. The consultants were given the task of determining means of improving operational procedures with a view to maximizing efficiency of canal operations. The results obtained were excellent.

The St. Lawrence Seaway Authority is responsible for the maintenance and operation of the Seaway Canal system. In fulfilment of its responsibilities, it has built up the required staff to undertake on its own, studies into means of operating at maximum efficiency. There are, at present, no foreseen hindrances to the effective performance of these functions and responsibilities.

No major changes in the Authority's functions or responsibilities are contemplated during the next five years.

1.3 Personnel Policies

No specific policies regarding the hiring of graduates for research activities have been developed since the Authority's demand for this type of personnel has been limited. Such professionals are recruited on an individual basis when their particular skills become necessary for research or related assignments. No unique criteria have been developed to identify those who will be creative and effective researchers, although a personnel audit which is to be undertaken shortly, will facilitate this task.

At present, with the small number of personnel involved in research activities, the task of identifying research administrators is left to the supervisors through employee appraisal. Within the Authority there are no special distinctions made between administrators of research and researchers, and such personnel are subject to the same regulations in respect to salaries, promotions etc., as are other employees.

It is Authority policy, regarding the education of staff members conducting or administering research, to participate in meeting the cost of tuition fees as a means of enhancing the efficiency of the organization.

Reimbursement requires that the course is related to the function of the employee, that it will improve his level of qualification and will be mutually beneficial to the Authority and the employee.

Where government sponsored courses are available employees are encouraged to participate; in such cases the Authority absorbs all necessary costs.

1.4 Distribution of Activities

All research expenditures are confined to those parts of Quebec and Ontario in which the St. Lawrence Seaway Authority operates. All scientific activities are, therefore, restricted to the St. Lawrence Seaway System which extends from Montreal to Lake Erie.

Over the past five years, investigations have been made into the canal system capacity and the development of means of optimizing canal operations on both the Welland and Montreal-Lake Ontario sections of the Seaway.

In general the construction of the Seaway has provided an economical mode of transportation which facilitates industrial development within its hinterland. Efforts and expenditures have been directed toward the objective of improving the efficiency of this water transportation service. Thus all scientific activities carried out by the St. Lawrence Seaway Authority benefit the area served by the Seaway system.

1.5 Personnel Associated with Scientific Activities

Note that the following personnel information pertains to each of Construction, Economics and Research, and Engineering Branches individually.

(A) Construction Branch

The current Construction Branch establishment numbers 211 employees of the following categories:

Engineers	34
-----------	----

Technical Officers, Technicians, and Draftsmen	150
--	-----

Administration, Clerical and Stenographers	27
--	----

From this total establishment there are six professionals associated with scientific research and one of this group is involved in administrative duties.

Information regarding the six professional staff of the Construction Branch involved in scientific activities is as follows:

Special Committee

	(i)	(ii)	(iii)	(iv) (a)	(iv) (b)	(v)	(vi)
No. For Each Degree Category	Country of Birth	Country of Secondary Education	Country of University Degree	No. Yrs. Working Since Graduation	No. Yrs. Working For S.L.S.A.	(Yrs) Avg. Age	Percentage Effective In Two Languages of Canada
Bachelor							
1	Canada	Canada	Canada	1	1		
1	Canada	Canada	Canada	2	2		
2	Estonia	Estonia	Canada	12	7	<u>28</u>	<u>25%</u>
Masters							
1	Canada	Canada	Canada	8	5		
1	Canada	Canada	Canada	19	5	<u>42</u>	<u>100%</u>
Doctorate							
Nil							

The total number of professional staff in each degree category for each of the years 1962 to 1968 inclusive and estimates for each of the years 1969 to 1973 are as follows:

	<u>Bachelors</u>	<u>Masters</u>	<u>Doctorate</u>
1962	1	Nil	Nil
1963	1	Nil	"
1964	1	2	"
1965	1	2	"
1966	1	2	"
1967	2	2	"
1968	3	2	"
1969 (Est.)	3	2	"
1970	3	2	"
1971	3	2	"
1972	3	2	"
1973	3	2	"

The percentage of turnover of professional staff in the three degree categories for each of the years 1962 to 1967 is nil. Since graduation none of the six professional staff have been employed with industry, while 20% have been on a university staff, 20% on the staff of provincial departments, and 20% on the staff of a federal agency.

At present none of the above staff are on education leave from the Authority.

Following is a listing of the number of university students given summer employment by the Construction Branch in the field of scientific activities for the years 1962 to 1967:

1962	-	Nil
1963	-	Nil
1964	-	Nil
1965	-	One
1966	-	One
1967	-	One

(B) Economics and Research Branch

The present establishment of the Economics and Research Branch numbers 12 employees which fall into the following categories:

Director of Economics and Research	1
Chief of Economics	1
Chief of Research	1
Research Officers	7
Secretaries	2

Special Committee

Two of the above staff are devoting most of their time to administrative duties. Information regarding the ten professional staff of the Economics and Research Branch involved in scientific activities is as follows:

	(i)	(ii)	(iii)	(iv) (a)	(iv) (b)	(v)	(vi)
No.For Each Degree <u>Category</u>	<u>Country of Birth</u>	<u>Country of Secondary Education</u>	<u>Country of University Degree</u>	<u>No.Yrs. Working Since Graduation</u>	<u>No.Yrs. Working (Yrs) For S.L.S.A.</u>	<u>Avg. Age</u>	<u>Percentage Effective In Two Languages of Canada</u>
Bachelor							
1	Canada	Canada	Canada	2	2		
1	Canada	Canada	Canada	4	4		
1	Canada	Canada	Canada	4	4		
1	Canada	Canada	Canada	1	1½		
1	Canada	Canada	Canada	17	3		
1	Canada	Canada	Canada	5	5		
1	China	China/ Australia	Canada	5	2		
1	China	Formosa	Formosa	11	3/4		
						<u>29</u>	<u>40%</u>
Masters							
1	Canada	Canada	Canada/USA	20	3		
1	China	Hong Kong	Canada	1	1		
						<u>37</u>	<u>Nil</u>

Doctorate

Nil

The total number of professional staff in each degree category for each of the years 1966 to 1968 inclusive and estimates for each of the years 1969 to 1973 are as follows:

	<u>Bachelors</u>	<u>Masters</u>	<u>Doctorate</u>
1966	3	2	Nil
1967	4	2	"
1968	8	2	"
1969 (Est.)	8	2	"
1970 "	8	2	"
1971 "	8	2	"
1972 "	8	2	"
1973 "	8	2	"

The Economics and Research Branch was established in 1966; since that time only one member of the staff, holding a bachelor's degree, has resigned. Thirty percent of the staff have been employed with industry since graduation, ten percent have been on the staff of provincial departments and thirty percent have worked for federal agencies.

At the present time there are no members of the Economics and Research Branch on education leave.

Special Committee

Since its inception in 1966 the Economics and Research Branch has given summer employment in the field of scientific activities to the following number of university students:

1966	2
1967	2
1968	Nil

(C) Engineering Branch

There are at present 184 employees in the Engineering Branch of the St. Lawrence Seaway Authority. This establishment is broken down into the following categories:

Engineers	74
Technical Officers, Technicians, and Draftsmen	74
Administration, Clerical, and Stenographers	36

Twenty-five of the above professional staff devote most of their time to administrative duties. Information regarding the professional staff of the Engineering Branch involved in scientific activities is as follows:

	(i)	(ii)	(iii)	(iv) (a)	(iv) (b)	(v)	(vi)
No. For Each Degree Category	Country of Birth	Country of Secondary Education	Country of University Degree	No. Yrs. Working Since Graduation	SLSA Service (Years)	Avg. Age (Yrs.)	Percentage Effective In Two Languages of Canada
<u>BACHELOR</u>							
1	Canada	Canada	Canada	8	5		
1	"	"	"	28	18		
1	"	"	"	3	3		
1	"	"	"	23	5		
1	"	"	"	12	2		
1	"	"	"	23	2		
1	Poland	Poland	Belgium	22	2		
1	Canada	Canada	Canada	2	2		
1	"	"	"	17	2		
1	Vietnam	Vietnam	China	6	3		
1	Canada	Canada	Canada	15	14		
1	"	"	"	17	14		
1	"	"	"	2	3		
1	"	"	"	4	3		
1	"	"	"	3	2		
1	"	"	"	14	4		
1	"	"	"	17	9		
1	"	"	"	18	14		
1	England	England	England	22	5		
1	Canada	Canada	Canada	2	2		
1	Hungary	Hungary	Hungary	15	5		
1	Canada	Canada	Canada	35	3		
1	Canada	Canada	Canada	11	4		
1	"	"	"	32	5		
1	Jamaica	Jamaica	Canada	5	5		
1	Poland	Poland	Poland	12	2		
1	"	"	England	21	3		
1	Russia	Canada	Canada	2	2		
1	Canada	"	"	2	2		
1	"	"	"	5	1		
1	Hungary	Hungary	Hungary	14	2		
1	India	Pakistan	Pakistan	7	4		
1	Holland	Holland	Canada	6	4		
1	Canada	Canada	Canada	2	1		

(Con't.)		(i)	(ii)	(iii)	(iv) (a)	(iv) (b) (v)		(vi)
<u>BACHELOR</u>								
No. For Each Degree Category	Country of Birth	Country of Secondary Education	Country of University Degree	No. Yrs. Working Since Graduation	SLSA Service (Years)	Avg. Age (Yrs)	Percentage Effective In Two Languages of Canada	
1	Canada	Canada	Canada	15	4			
1	"	"	"	6	3			
1	China	China	China & Germany	13	2			
1	China	China	Canada	16	4			
1	Canada	Canada	Canada	27	5			
1	Canada	Canada	Canada	5	3			
1	"	"	"	12	2			
1	"	"	"	24	14			
1	"	"	"	11	4			
1	Poland	England	England	12	4			
1	Canada	Canada	Canada	20	10			
1	"	"	"	8	6			
1	Canada	Canada	Canada	21	14			
1	"	"	"	8	1			
1	"	"	"	4	4			
1	"	"	"	15	2			
1	"	"	"	10	4			
1	Estonia	Estonia	Canada	7	4			
1	Canada	Canada	Canada	20	14			
1	Turkey	Turkey	Turkey	8	1			
1	Canada	Canada	Canada	2	2			
1	Lithuania	Canada	Canada	6	2			
1	Turkey	Turkey	Turkey	12	6			
1	Canada	Canada	Canada	18	14			
1	"	"	"	2	3			
1	"	"	"	20	1			
						35	20%	

No. For Each Degree Category	(i) Country of Birth	(ii) Country of Secondary Education	(iii) Country of University Degree	(iv) (a) No. Yrs. Working Since Graduation	(iv) (b) SLSA Service (Years)	(v) Avg. Age (Yrs)	(vi) Percentage Effective In Two Languages of Canada
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MASTERS

1	Canada	Canada	Canada	32	14		
1	China	China	China & USA	22	5		
1	Ireland	Ireland	Ireland	3	2		
1	China	China	China & Can	6	4		
1	India	India	India & Can	14	3		
1	Russia	Austria	Austria	32	3		
1	Poland	Poland	Poland & England	26	2		
1	Canada	Canada	Canada	4	4		
1	China	China	China & Can	13	3		
1	Poland	Poland	Poland	33	2		
1	Estonia	Estonia	Canada	2	4		
1	Pakistan	Pakistan	Pakistan & Canada	18	8		
1	Scotland	Scotland	Canada	23	5		
1	China	China	China & USA	28	4		
					<u>42</u>		<u>20%</u>

The total number of professional staff in each degree category for each of the years 1962 to 1968 inclusive and the estimates for the years 1969 to 1973 as well as the percentage of turnover for the years 1962 to 1967 inclusive are not available.

Fifteen percent of the above professional staff, were at one time, employed by industry, eight percent were employed by universities, two percent were employed on provincial department staffs and fifteen percent have been employed by other federal agencies.

There are no professional staff of the Engineering Branch on education leave.

The number of university students given summer employment in the field of scientific activities is not available.

1.6 Expenditures Associated With Scientific Activities

The total funds spent by the St. Lawrence Seaway Authority on scientific activities, as well as the operating and capital funds expended by those units of the Authority involved in research, are included in Appendix 'E'. The Construction, Economics and Research and Engineering Branches are involved in such functions.

Information concerning funds expended to further professional university education of staff associated with scientific activities is not available.

1.7 Research Policies

(a) Units Concerned With Intramural Research Activities

Various projects and programmes are selected and initiated according to the requirements of the shipping industry for an efficient and economical transportation artery. A preliminary study is carried out to define the problem, its scope and magnitude, and the cost and possible payoffs. Initiation is dependent on cost benefit considerations indicated by a feasibility study. Progress of programmes is monitored against a critical path method (CPM).

Advice is sought from other government agencies, principally the National Research Council.

Priorities between programmes and projects are determined through cost benefit analysis. Two general criteria are used: (a) reduction in transit times through the system benefiting the shipping industry; and (b) extension of the capacity and life of the present system.

Critical Path networks are used on extensive programmes and projects; plans are being made to use this system on lesser projects when computer software is available.

Special Committee

Where special expertise is required and such talents are not available within the organization, consultants are retained on a project basis. If special laboratory facilities are required, contracts are issued to cover the scope of necessary testwork. As noted earlier a system study of the traffic congestion on the Welland Canal, which included the development and implementation of procedural changes and traffic control system was contracted out to Kates, Peat, Marwick, & Company. Other examples of contracting out are as follows:

Windbreak Design	Welland Canal - Dilworth Secord & Meagher Consulting Engineers, Toronto, Ontario.
Hydraulic Model Studies	Lasalle Hydraulic Laboratories, Montreal.
Tunnel - Welland	H. G. Acres, Niagara, Ontario.
Specification for Hydraulic Oil System	Dowty, Toronto, Ontario.
Buildings	Architects and Consultant Engineers, Montreal, Quebec.

The Seaway has not developed any policies regarding the funding of extramural research programmes in the universities and industry since requirements of this nature are very limited.

Intramural and contracted external research relating to the Seaway are of such a specific nature that they are of little importance to external interests. When reports are produced that are relevant to other agencies or departments of government, copies of such publications are provided to these entities on a routine basis.

1.7 (b) Units Exclusively Concerned With Extramural Research Activities

The St. Lawrence Seaway Authority is not concerned with the funding of extramural research activities.

1.8 Research Output

To date there are no patents arising from research activities, nor licences granted to the St. Lawrence Seaway Authority as a result of these activities. As well, there are no books or journals arising from such research. Reports issued from the St. Lawrence Seaway concerning its research activities are as follows:

- (a) Computer Feasibility Report on the Seaway's data processing needs and the selection of a medium-sized computer.

- (b) Expansion of the St. Lawrence Seaway Facilities: a two volume report edited by the Economics and Research Branch (contributing to the cargo forecast, traffic, capacity, benefit-cost analysis and traffic control sections).
- (c) Report on the 'Economic Implications Associated With the Closing of the Lachine and Cornwall Canals.'
- (d) Reports on 'Data Collection and Traffic Control Systems'.
- (e) 'Soil Stratigraphy' - Welland Bypass.
- (f) Preliminary Zoning of Soils - Thorold to Lake Ontario (New Canal Alignment).
- (g) The Properties of the Queenston Shale Areas of Lock 1, 2, and 3, Welland Canal.

One means of transferring information regarding the results of a project or programme to extramural groups is the presentation of a paper at a conference. For example, the Authority presented a joint paper at the 1967 Canadian Operational Research Society on Simulation of a St. Lawrence Seaway System. This transfer pertains to information obtained in Canada, for the Authority has not had the occasion to communicate scientific and technological data obtained outside of Canada.

There are no known individuals who had the opportunity to train themselves in a specialized field while employed with the Seaway and subsequently left and made important contributions to their field.

Within the St. Lawrence Seaway the Traffic Control System Study Team has unique and valued abilities in marine traffic control as applied to canal systems, data collection equipment, computer system design, computer display systems and canal system simulation.

Between 1966 and 1967 the Authority has developed a Seaway Simulation Language (SEASIM) which is a FORTRAN IV oriented general purpose language, permitting the simulation of a canal system. This provides the capability of varying parameters individually or in combinations to obtain the optimal solutions.

Present developments in Traffic Control and Ship Alignment and the Mooring System programme are expected to result in a more efficient inland transportation system in Canada. The automatic data collection system and microwave sensors for detecting vessel passages on the Montreal-Lake Ontario Section of the Seaway is the first application of its kind. This installation is intended to provide the data required to improve canal operations and possibly extend its capacity.

The development of positive traffic control for the Welland Section of the Seaway has permitted continued growth of Seaway traffic, increased efficiency to the shipping industry and an extension of the Seaway hinterland.

By maximizing the capability of existing Seaway System facilities, large capital expenditures may be postponed for several years. These developments contribute to expansion in the primary sectors of the economy, principally agriculture and base metal mining.

1.9 Projects

Following are brief descriptions of projects which were conducted during the years from 1962 to 1968:

(a) Welland Canal Traffic Capacity Study (1966 - 1968)

An in-depth examination through a system simulation of the present and future capacity of the Welland Canal has been carried out. As a result of this study, various changes in the demand forecast, cargo flow patterns, and operating parameters have been implemented.

(b) Data Collection System

The installation of a Data Collection System, a project of the Traffic Control Programme on the Montreal-Lake Ontario section of the Seaway, required the development of an on-line real time computer system. This system uses 48 on-line digital sensors, a 4,000 word computer, teletype sensors, 12 loop detectors, gate and ship arrestors, and lock filling and dumping machinery.

(c) Traffic Control System (1967 - 1968)

Conceptual design of the Traffic Control System for the Montreal-Lake Ontario section of the Seaway has been completed and detailed design and implementation are now in progress. This system will be aided by a centralized on-line real time computer using automatic data collection, extensive communications, surveillance, and an electroluminescent display system.

(d) Extension to the Navigation Season (1964 - 1968)

In 1964 the St. Lawrence Seaway Authority established a committee of Authority personnel to study the extension of the navigation season. Numerous experiments, tests, and observations have been made with regard to de-icing of canals and locks. These works involve the study of weather, water velocity and temperature, and ice formation both in the shipping channels and on locking equipment. This project and its many contingent programmes is being continued.

The most significant projects completed during the past five years by units of the St. Lawrence Seaway engaged in scientific activities are as follows:

(e) Applied Research - Welland Canal Capacity Study

Between 1964 and 1967 the Welland Canal suffered serious congestion, requiring the ships to form queues and operate below maximum efficiency. An Operations Research consultant was employed to study the system and recommend improvements. This resulted in extending the life of the present facilities and demonstrated that a new system was more advantageous than a twinning of the existing facilities. Therefore, during the period between 1965 - 1967 the Seaway Authority prepared plans to extend the system. In 1968 a re-evaluation was carried out of present and future capacity using the most up-to-date data.

(f) Applied Research - Soil Cement

Applied research in the field of soil-cement has been carried out in the Materials Laboratory, Construction Branch, during the period extending between October 1966 and October 1968. This construction material is being evaluated for use as slope protection from Port Robinson, Ontario to Port Colborne, Ontario.

Various granular materials available in the Niagara Peninsula area have been studied for suitable use in soil-cement and a laboratory program has been carried out to investigate the effect of sulphate laden soil and groundwater on this construction material.

Applied research in the field of concrete aggregates and concrete mix designs has been carried out on a continuing basis to evaluate the performance of local materials in concrete mixtures.

As a part of the modernization programme of the existing Welland Canal and the building of new sections of the canal, both preliminary and detailed studies have been made of the soils and rock formations found in the area. These projects have necessitated the sampling, logging and testing of materials encountered in the various construction projects. The data obtained is passed on to the Engineering Branch in Montreal where it is used in the design of new facilities.

(g) Development: Montreal - Lake Ontario Capacity Study.

In 1966 a capacity study similar to that performed on the Welland Section of the Seaway was carried out on the Montreal - Lake Ontario Section. This study revealed the need for more comprehensive data on vessel movements. In 1967 a data collection system was designed and implemented. The installation of the automatic system was completed by mid-June of 1968.

(h) Development: Ship Alignment and Mooring System

The Authority is presently engaged in the development of a ship alignment and mooring system. Mathematical model testing, computer run, and hydraulic model testing will establish the magnitude of forces acting on a vessel entering a restricted area (80' wide). Design of the system will incorporate all the latest technology in oil hydraulics and electronic sensing.

1.10 Organizations Not Currently Engaged in Scientific Activities

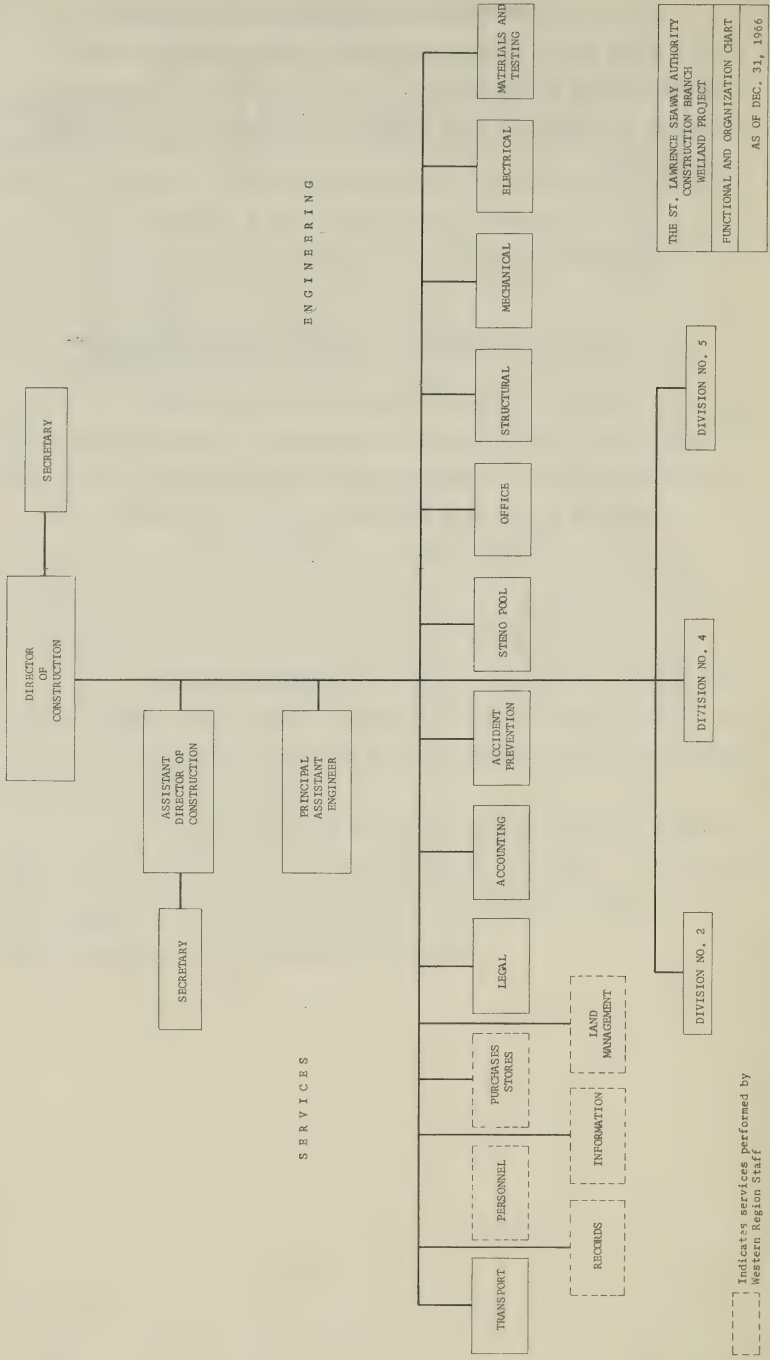
Due to the economics of scale, increased automation of vessels and generally rising costs, sophistication of the Seaway system will be demanded by the water transportation industry. The traditional methods of handling vessels and policies of traffic control must be constantly adapted to changing conditions if water borne transportation is to compete as an efficient mode of transportation.

Major programmes being developed and implemented by the Seaway are directed toward a more efficient transportation system. Applied research and development will be carried out on a continuous basis.

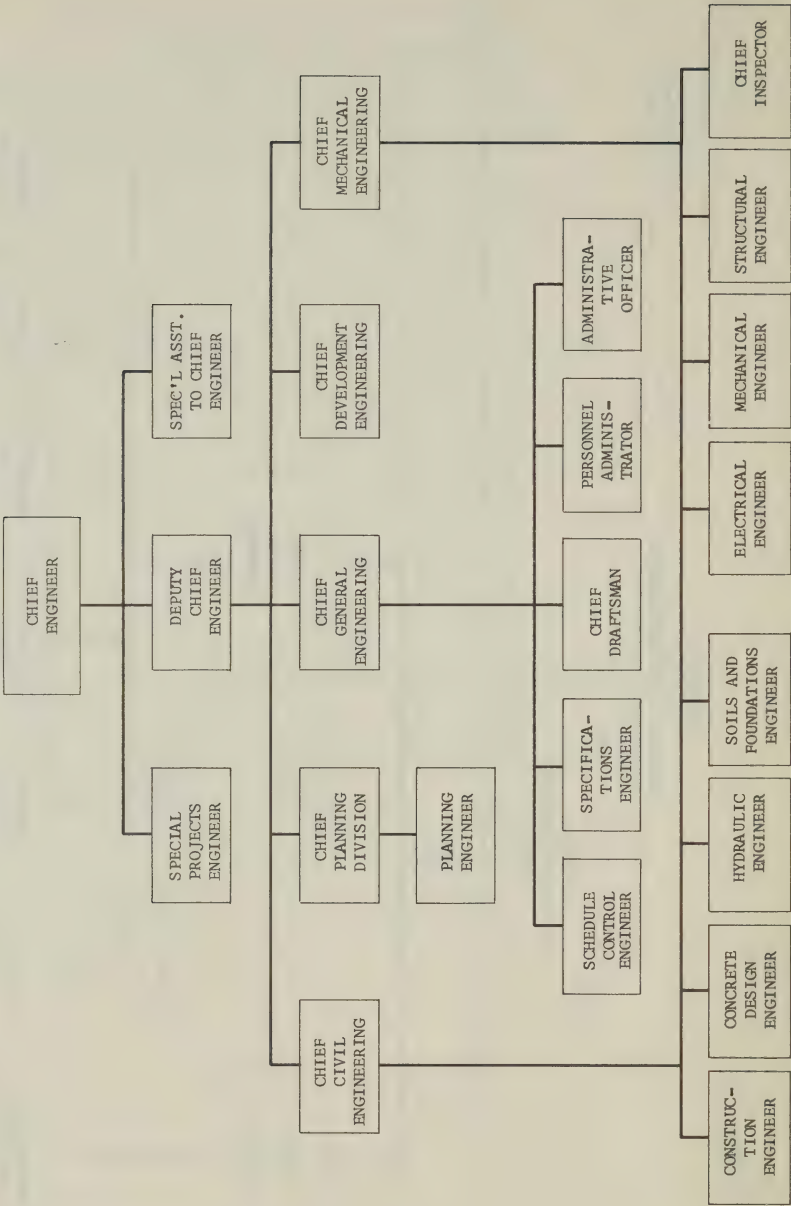
Scientific and technical advice has been sought from technical societies, National Research Council, U.S. Corps of Engineers, as well as consultants on subjects ranging from canal capacity to windbreaks for vessels.

In general all programmes are designed in such a way as to take into account and accommodate any technological breakthroughs that are possible. Continuing efforts are made to stay abreast of developments in related disciplines.

APPENDIX "B"

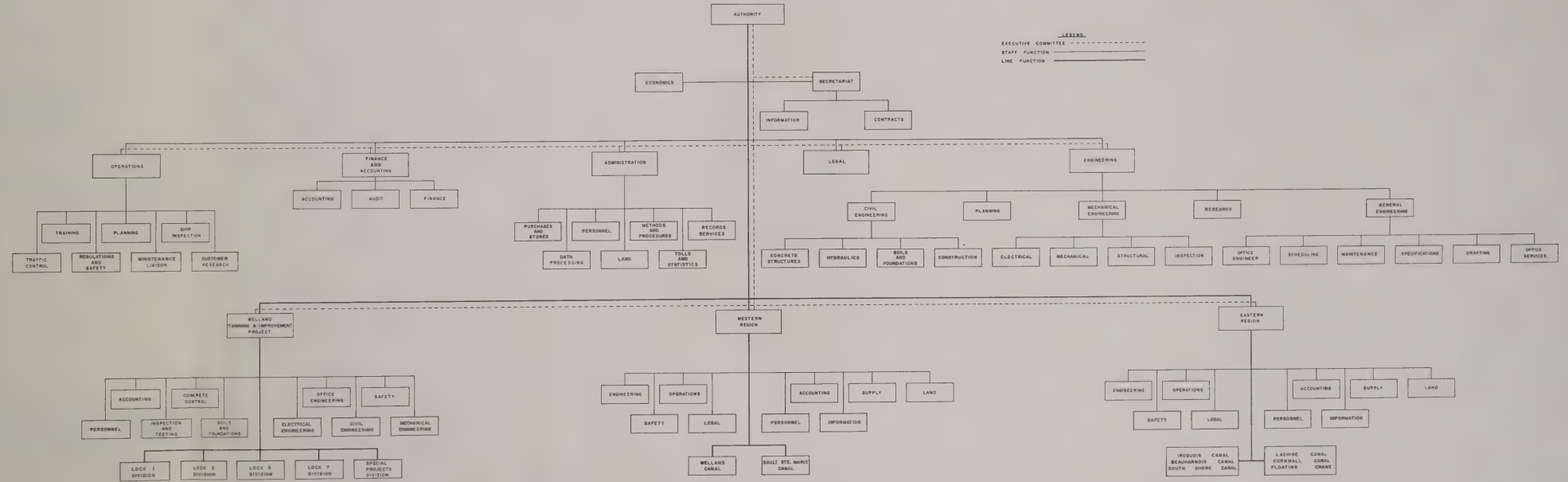


APPENDIX "D"
ENGINEERING BRANCH



APPENDIX "A"

THE ST. LAWRENCE SEAWAY AUTHORITY FUNCTIONAL CHART





Publication

First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 43

WEDNESDAY, MAY 21st, 1969

WITNESSES:

Dr. L. B. Macdonald, Executive Vice-President, Committee of Presidents of Universities of Ontario; Dr. J. Stefan Dupré, Director of the Centre for Urban and Community Studies, University of Toronto; Dr. Ernest Sirluck, Vice-President and Graduate Dean, University of Toronto; Dr. Erich W. Vogt, Professor, Physics Department, University of British Columbia.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Wednesday, May 21st, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Blois, Bourget, Cameron, Grosart, Haig, Kinnear and McGrand (9).

In attendance:

Philip J. Pocock, Director of Research (Physical Science)
Gille Paquet, Director of Research (Human Science)

The Committee questioned four of the eight authors of Special Study No. 7 entitled "The Role of the Federal Government in Support of Research in Canadian Universities" prepared for the Science Council of Canada and the Canada Council:

Dr. L. B. Macdonald, Executive Vice President, Committee of Presidents of Universities of Ontario; Dr. J. Stefan Dupré, Director of the Centre for Urban and Community Studies, University of Toronto; Dr. Ernest Sirluck, Vice-President and Graduate Dean, University of Toronto and Dr. Erich W. Vogt, Professor, Physics Department, University of British Columbia.

(A curriculum vitae of each witness follows these Minutes)

At 12.30 p.m. the Committee adjourned until 2.30 p.m. this day.

AFTERNOON SITTING

The Committee resumed at 2.30 p.m., the Chairman, Senator Lamontagne, presiding.

Present: The Honourable Senators Lamontagne (*Chairman*), Blois, Bourget, Cameron, Carter, Grosart, Haig, Kinnear and Yuzyk (9).

In attendance:

Philip J. Pocock, Director of Research (Physical Science)
Gille Paquet, Director of Research (Human Science)

The witnesses at the morning sitting were further questioned.

At 5.00 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Dupré, J. Stefan. Born Quebec, Que., November 3, 1936. Married 1963. B.A. (University of Ottawa), 1955; A.M. (Harvard University), 1957; Ph.D. (*ibid.*), 1958. *Teaching Positions:* Harvard University: Teaching Fellow in Government, 1956-57; Instructor in Government, 1958-59; Assistant Professor of Government, 1961-63; University of Toronto: Associate Professor of Political Economy, 1963-66; Professor of Political Economy, 1966-. *Academic Administration:* Secretary of the Graduate School of Public Administration, Harvard University, 1960-63; Director of the Centre for Urban and Community Studies, University of Toronto, 1966-. *Other Positions:* Research Fellow, The Brookings Institution, Washington, D.C., 1957-58; Ford Foundation Law Fellow, University of Wisconsin, 1959; Editorial Director, The Ontario Committee on Taxation, 1964-67; Member, Ontario Civil Service Arbitration Board, 1965-; Member, Science Council – Canada Council Study Group on Federal Support of University Research, 1967-68; National Vice President, Institute of Public Administration of Canada, 1967-; Member, National Research Council of Canada, 1969-. Author: *Intergovernmental Finance in Ontario* (1968); *Science and the Nation* (with S. A. Lakoff, 1962); many articles on public administration, public finance and intergovernmental relations.

Macdonald, John Barfoot. Born: February 23, 1918, Toronto, Ontario. 1942, D.D.S., University of Toronto (with honors); 1948, M.S., University of Illinois (Bacteriology); 1953, Ph.D., Columbia University (Bacteriology); 1955, F.A.C.D., 1956, A.M., Harvard University (honorary); 1962, LL.D., University of Manitoba (honorary); 1965, F.I.C.D., (honorary); 1965, LL.D., Simon Fraser University (honorary); 1967, D.Sc., The University of British Columbia (honorary); 1942-44, Lecturer, Preventive Dentistry, University of Toronto, and private practice; 1944-46, Canadian Dental Corps (released as Captain); 1946-47, Instructor, Bacteriology, University of Toronto, and private practice; 1947-48, Research Assistant, University of Illinois; 1948-49, Kellogg Fellow, and Canadian Dental Association Research Student, Columbia University; 1949-53, Assistant Professor of Bacteriology, University of Toronto.

1953-56, Associate Professor of Bacteriology, University of Toronto; 1953-56, Chairman, Division of Dental Research, University of Toronto; 1956, Professor of Bacteriology, University of Toronto; 1955-56, Consultant in Dental Education, University of British Columbia; 1956-62, Director, Forsyth Dental Infirmary; 1956-62, Professor of Microbiology, Harvard School of Dental Medicine; 1958-62, Consultant to Dental Medicine Section of Corporate Research, Division of Colgate-Palmolive Company; 1960-62, Director of Postdoctoral Studies, Harvard School of Dental Medicine; 1961-65, Member, Dental Study Section, National Institutes of Health; 1962, Consultant in Bacteriology, Forsyth Dental Infirmary; 1962-67, President, The University of British Columbia; 1967, Consultant to the Donwood Foundation, Toronto, 1967, Consultant to Science Council and Canada Council on Support of Research in Canadian Universities; 1967, Chairman, Commission on Pharmaceutical Services, Canadian Pharmaceutical Association; 1968, Consultant, National Institutes of Health; 1968, Executive Vice-

Chairman, Committee of Presidents of Universities of Ontario; 1968, Professor of Higher Education, University of Toronto; 1968, Consultant, Addiction Research Foundation, Toronto.

1949-54, Member, Canadian Dental Association Research Committee (Chairman 1951-54); 1949-52, Member, Ontario Dental Association Public Health Committee; 1950-60, Member, Canadian National Research Council Committee on Dental Research (Chairman 1954-57); 1956, Member, Canadian Dental Association Research Committee; 1957-58, Member, Scientific Commission on Dental Research of the Federation Dentaire Internationale; 1958-62, Member, Advisory Board of Massachusetts Dental Hygienists Association; 1959-63, Member, Medical Advisory Board of Iran Foundation; 1963, Councillor-at-Large of the International Association for Dental Research; 1958-61, Associate Editor of *Journal of Dental Research*; 1958-62, Regional Editor, *Archives of Oral Biology*; 1958-63, Editor, *International Series on Oral Biology*; 1962-63, Member, Honorary Editorial Advisory Board, *Archives of Oral Biology*; 1963, Consulting Editor, *Archives of Oral Biology*; 1968, President, International Association for Dental Research, Honor Award Key, University of Toronto, 1942, (President of Student Government Faculty of Dentistry 1941-42) Charles Tomes Lecturer, Royal College of Surgeons (Eng.) 1962.

Memberships: International Association for Dental Research; Canadian Dental Association; New York Academy of Sciences; American Association for Advancement of Science; American Society of Microbiologists; Honorary Member, Harvard Odontological Society; Honorary Member, New England Dental Society; Honorary Fellow, American Academy of Dental Science; Canadian Council of Christians and Jews, Member, Pacific Region Board of Directors; Honorary Member, Vancouver Dental Society; Vancouver Board of Trade; The Men's Canadian Club of Vancouver.

Honorary Offices: 1962, Honorary President, The Vancouver Institute; 1963, Honorary Director, Muscular Dystrophy Association of Canada; 1963, Honorary Vice-President, The Canadian Red Cross Society; 1963, Honorary President, Vancouver Public Aquarium Association; 1963, Honorary President, The University Club of Vancouver; 1963, Honorary President, Alumni Association of the University of British Columbia; 1964, Honorary Director, British Columbia Civil Liberties Association; 1964, Honorary Chairman, Vancouver Civic Unity Association; 1964, Convocation Founder, Simon Fraser University; 1965, Honorary Governor, Shawinigan Lake School; 1965, Member of Board of Honorary Governors, Canadian Association for Retarded Children.

Married Liba Kucera: two sons (John Grant, Scott Arthur) and three daughters (Kaaren Campbell, Vivian Jane, Linda Rosemarie).

Sirluck, Ernest. M.B.E., B.A. (Man.), M.A. and Ph.D. (Toronto), LL.D. (Queen's), F.R.S.C. 1918, born, Winkler, Manitoba; 1940, B.A., University of Manitoba; 1941, M.A., University of Toronto; 1941-42, Ph.D. student, University of Toronto; 1942-45, Canadian Army (Overseas 1943-45: 1 Battalion Royal Regiment of Canada; HQ 2 Canadian Division, 4 Canadian Armoured Division; discharged with rank of major); 1945, Member of the Order of the British Empire (Military Division); 1945-46, Ph.D. student, University of Toronto, and Teaching Fellow, Department of English, University College; 1946-47, Lecturer,

University College, Toronto; 1947-62, University of Chicago, Department of English (1947-53 Assistant Professor, 1953-58 Associate Professor, 1958-62 Professor); 1948, Ph.D., University of Toronto; 1951-52, President, Midwest (now Newberry Library) Renaissance Conference; 1953-54, Guggenheim Fellow (year spent in British Museum); 1957, Chairman, Section 4, Modern Language Association of America; 1958-59, American Council of Learned Societies Fellow (year spent in British Museum).

1959, Chairman, Section 6, Modern Language Association of America; 1959-65, Founding President, Renaissance English Text Society; 1960-62, Board of Directors, Centre for Continuing Education, Chicago; 1962 ff., Professor of English, University College, University of Toronto; 1962-64, Associate Dean, School of Graduate Studies, University of Toronto; 1964 ff., Dean, School of Graduate Studies, University of Toronto; 1969 ff., Vice President and Graduate Dean, University of Toronto; 1962 ff., Chairman, Ontario Committee of Graduate Deans (now Ontario Council on Graduate Studies); 1963 ff., Fellow of the Corporation of Massey College; 1963-65, Board of Directors, Midwest Inter-Library Centre (Chicago); 1963-65, Final Review Committee, Canada Council; 1964-68, Woodrow Wilson Dissertation Fellowship Selection Committee; 1964-67, Canadian Committee for Commonwealth Scholarships and Fellowships; 1964-66, Committee on International Education, Association of Graduate Schools (U.S.); 1965 ff., Board of Governors, Ontario Institute for Studies in Education; 1966, Overseas Fellow, Churchill College, Cambridge; 1966-, Policy Committee, Association of Graduate Schools (U.S.); Chairman, 1968-69; 1966-, Member, Universities Committee on the St. Lawrence Centre for the Arts; 1967, Elected a Fellow of the Royal Society of Canada; 1967-69, Science Council – Canada Council Study of Research in Canadian Universities; 1967-68, Vice-Chairman, Advisory Joint Council Ontario Graduate Deans and Librarians; Chairman, 1969; 1967-69, Member, Ontario Graduate Appraisals Committee; 1968, L.I.D., Queen's University (Kingston).

Married Lesley Caroline McNaught (1942) (2 children).

Societies: Royal Society of Canada; Modern Languages Association; Association of Canadian University Teachers of English; Canadian Association of University Teachers; Association of American University Professors; Canadian Civil Liberties Association; Renaissance English Text Society.

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Vogt, Erich Wolfgang. Born Steinbach, Manitoba, November 12th, 1929. Educated in Manitoba, B.Sc. 1951, M.Sc. 1952 (University of Manitoba), Ph.D. in theoretical physics at Princeton University (1955), NRC Postdoctoral Fellow at the University of Birmingham in England 1955-56; Assistant Research Officer at Chalk River Nuclear Laboratories 1956-58, Associate Research Officer 1958-60, Senior Research Officer, 1960-65, visiting Associate Professor in Physics at the University of Rochester 1958-59; Professor at the University of British Columbia 1965; Associate Director of the TRIUMF project (a four-university accelerator project in Western Canada, funded in 1967) 1967-; Vice-president-elect, Canadian Association of Physicists; author of numerous papers on the theory of nuclear reactions and in theoretical physics; married to Barbara Mary Greenfield of Winnipeg, Manitoba on August 27th, 1952; five children; Edith Susan, Elizabeth Mary, David Eric, Jonathan Michael, Robert Jeremy.

SPECIAL SENATE COMMITTEE ON SCIENCE POLICY EVIDENCE

Ottawa, Wednesday, May 21, 1969

The Special Senate Committee on Science Policy met this day at 10 a.m.

Senator Maurice Lamontagne (*Chairman*) in the Chair.

The *Chairman*: We are beginning this morning the third and last phase of our public hearings, during which we will receive representations from the so-called private sector including universities, industries, and national organizations interested in science policy. We have already received over 200 briefs from that sector, and we are now in the process of organizing our hearings for the latter part of this month and the month of June with the hope that the committee will terminate its public hearings at the end of June. Some members of the committee are senators for life and others until age 75, and we do want to publish a report. Before that report can be published it must be prepared, and in order to prepare it we shall have to terminate our public hearings at some stage. So, it is the intention of the committee to conclude its public hearings by the end of June, and to have its report ready by October.

At the commencement of this last phase we shall hear from the university sector. Next week there will be a series of hearings during which most of the Canadian universities will make presentations. On Tuesday afternoon we will hear from the universities in the Atlantic provinces, and on Wednesday from the universities in Quebec and Ontario, and on Thursday morning from the universities in the western provinces. For Thursday afternoon we are contemplating a meeting with all the universities, which will be a kind of a "jam session." This will be the first meeting of its kind, and we hope that we shall be able to obtain some kind of a national view from the universities at that time.

To begin this exercise we are very happy to have with us this morning Dr. John B. Macdonald who, with his colleagues, worked on this very extensive report that was prepared at the joint request of the Canada Council and the Science Council of Canada. This report is entitled, "The Role of the Federal

Government in Support of Research in Canadian Universities". We think that this discussion today will provide a wonderful background for our discussions with the individual universities next week.

This morning we have with us Dr. John B. Macdonald, executive Vice-President to the President of Universities of Ontario and Professor of Higher Education at the University of Toronto; Dr. Stefan Dupré, Director of the Centre for Urban and Community Studies at the University of Toronto, and Professor of Political Economics at that same university, and Dr. Ernest Sirluck, Professor of English and Vice-President and Graduate Dean of the University of Toronto.

As you can see, there is a heavy representation from that university. I do not know if it is fair or if it is typical of the Canadian scene, but fortunately we have an exception, Dr. Erich W. Vogt of the Physics Department, University of British Columbia. I understand that Dr. Dugal of Sherbrooke University was invited to be part of this group, but he has not been able to attend the meeting because of illness.

I think that the members of the committee will want to concentrate on the latter part of your report, Dr. Macdonald, starting with chapter 5 and on. Although there might be questions on the first part as we go along, we do understand that this is the substantive part of your report. Before doing this, I would invite you to make an opening statement to the Committee.

Dr. John Macdonald, Executive Vice-President to the President of Universities of Ontario: Thank you. Mr. Chairman, and honourable senators, I would like to begin by expressing, on behalf of the members of the study group, our appreciation for this invitation to come as witnesses before this committee. I would also like to thank you for waiting until we had completed our assignment before inviting us here. You were making such rapid progress in your hearings and we were a little uneasy at one stage that we might be called upon before we were, indeed, ready to report. At the same time I am personally sorry, Mr. Chairman, that we are appearing before your

committee after my predecessor, Dr. Larry MacKenzie, has left the Senate. It would have been a great pleasure for me to have appeared before this committee with him still serving as a member. He was my predecessor at the University of British Columbia and was President for a remarkably long period of 18 years, and at a time when presidents took on that kind of post for a lifetime. It is not so long these days, as all of us know. I was at Harvard a week ago and I learned that the question being asked by United States university presidents these days is, "Why not quit while you are behind?"

Mr. Chairman, I would like to introduce the remainder of my colleagues, since it does happen that those who are present today, three out of four of us, do represent the University of Toronto. That was somewhat accidental. The membership of the committee, as shown on the cover of the report, indicates that, in addition to those who are here today, there is Dr. Dugal, Vice-Rector of Administration and Research, University of Sherbrooke, and Dr. Bruce Marshall, National Research Council. We also have Dr. J. Gordon Parr, Dean of Engineering at the University of Windsor, and Dr. Guy Rocher from the University of Montreal, Department of Sociology. He worked with us throughout most of the study, but because he went on a leave of absence to the University of California, he was not actually engaged in the authorship of the report.

The reason for the choice of members of the study group, who are attending the meeting this morning, is to ensure that you have before you representatives of the sciences, in Dr. Vogt, and the social sciences, in the person of Dr. Dupré, and humanities, in the person of Dr. Sirluck. It just happened that that worked out to the University of Toronto, which I think from the standpoint of most other parts of the country, would be looked upon as an unfortunate coincidence.

I would like, Mr. Chairman, to make only a brief introductory statement of an informal nature on the assumption that you will consider the report itself as our formal statement. We began the study about two years ago under the sponsorship of the Science Council and the Canada Council, and our terms of reference are set forth in the report itself. They were to examine the present level sources and conditions of federal support and the purposes, principles, policies, organization and management, which will serve to improve the quality of research in the universities through the efforts of the federal support program. The report itself is not a package which has to be accepted in total or rejected in total. Nevertheless, there is a theme to it and I think the principal theme is that we see the performance of research in universities as an enterprise involving three principal partners: the federal Government, provinces

and the universities. Each of these partners has its own purposes and responsibilities.

I might briefly indicate the ways in which we see those responsibilities dividing. The provinces, of course, provide direct support for universities, as educational institutions and they are reimbursed for 50 per cent of the ordinary expenditures through the federal fiscal transfer arrangement. The support which the provinces provide includes salaries of academics, the indirect cost of research, whether the direct costs are supported by the province or the federal Government or by, other agencies. The provinces also provide graduate education, again because it is education and they pay the cost of that and provide some of the graduate students' support, actually, approximately 50 per cent of the total graduate students' support now available that is 50 per cent of about \$42 million. They have, in general, provided most of the buildings for research, although in earlier years, the Canada Council was supporting the construction of buildings in the social sciences and humanities areas, which did relate to research, but the fund for that purpose has now expired. Currently, the health resources fund is used to provide some support for buildings on the campuses but that is a small part of the total building required and in general it is fair to say that the provinces themselves have been responsible for providing the buildings which are required for research purposes.

In addition, the provinces do provide some direct support of research, but the amount is not large. In 1966-67 it was only \$11.7 million but that amount we would expect is likely to grow over the years ahead.

We argue in our report that the provinces should continue to pay salaries of academics and that the federal Government should not provide this particular component of the requirements of research. The reason for this is that we feel it important that the universities retain control over the destiny of the university.

In the United States there are many instances in which agencies will pay the salaries of academics working in the universities and doing research and this leaves open the opportunity for entrepreneurs to engage large numbers of faculty through funds which they bring into the university and for the universities to develop a balance of program which is perhaps not what they initially intended to do.

We believe that balance of program is a matter which should lie in the hands of the university and should be exercised by the university and that one of the best ways of seeing this accomplished is to see that the balance of program is the university's responsibility and not something subject to grants,

agreements or contracts with federal agencies or outside agencies.

We feel that the provinces should continue to support graduate education—again, because it is education—and in respect to graduate students we see an important role for the province to play—again, because it is education—but it is clear that there is a federal interest here, too.

The support of graduate students does relate to the training of manpower for research. The universities are the source of virtually all of the trained manpower for research, both for their own purposes and for industry and for government. If there is to be a viable research support program it does have to involve the training of manpower for research. We suggest, therefore, that the federal role at this level be exercised through permitting the support of graduate students coming through provincial sources to be allowed in the fiscal transfer arrangements. This would automatically involve the federal Government in 50 per cent of the cost of the support of graduate students.

The federal Government, for its part in this partnership, we believe has two main interests. The first one, and the one which we would hope would not be overlooked, is that the federal Government itself have an interest in strong universities in Canada as a goal in itself. That interest has been expressed principally through the work of the National Research Council, the Medical Research Council and the Canada Council who, in 1967-68 provided about \$77 million in support, including student support, as well as the direct support of research.

The second interest of the federal Government is in the procurement of research which relates to the other goals of the federal Government—in industry, fisheries, agriculture, health, whatever they may be. We see no reason why the federal interest in this area should not be expressed by the procurement of research from the universities which does relate to the work of Government itself.

In this case, it is the mission-oriented agencies of Government which in general would provide the support. In 1967-68 they provided about \$20 million in support—a very small portion of course of the total research supported by the federal Government, that is, a very small portion compared to the *intra mural* research of the Government itself. In short, the federal Government has provided about \$100 million in 1967-68 by way of direct support.

Traditionally the federal Government, through the councils, has supported some areas, some disciplines, and not others. We are inclined to feel, Mr. Chairman, that the decision about areas to support is not being exercised on the basis of any clearly developed policy,

but has been *ad hoc* responses to particular situations—with the result that there are many areas within universities, many areas within disciplines, which have not been eligible for support from the federal Government through the councils. I think this is brought out clearly in the context of our report.

We therefore recommended that the policy should be that all disciplines within the universities should be eligible for support through the councils because of the federal Government's concern to have strong universities in Canada and strong universities suggests of course the need for a balanced research program in the universities.

I should say a word or two—although I am sure this will come up in the course of the day—about the role of the federal Government in providing indirect cost. Since we have concluded that having strong universities is a goal of the federal Government and that having strong universities requires a balanced program of research, for this reason alone we think it important that the federal Government pay the indirect costs of the research which it supports. Failure to do so has already distorted budgetary processes in universities because these indirect costs are real costs and they have to be borne by the universities out of their general revenues.

This means that in those disciplines or those areas where research activity is strong, the universities are having to divert general revenues to the support of these areas and do not have those funds available for the support of other areas where research is not being undertaken vigorously. This is clearly a distortion of the budgetary processes and one which was drawn to our attention by the universities across the country in the course of our visits.

We have suggested that there could very well be a role for the federal Government in the provision of buildings for research. It is clear to us, from our studies and from the reports given to us by university administrators and academics, that one of the principal bottlenecks in the strengthening of research in universities is the lack of adequate buildings for research purposes.

A survey which we undertook in this area indicates that the requirements for buildings for research alone—that is, not teaching purposes, but research—is about \$120 million per year up to 1974-75, or about 40 per cent of the total building requirements up to that period. This is a crucial bottleneck, and we have suggested a mechanism by which we think it could be resolved. We have called for a federal-provincial conference to consider the establishment of a research facilities corporation which would administer a research facilities fund and allocate funds to universities on the basis of application, the judgment of merit, need for balance among regions and need

for balance among French-speaking and English-speaking universities.

I turn briefly, Mr. Chairman, to the role of universities. I would first like to emphasize that the universities do have, always have had and we hope always will have a fundamental responsibility to support basic research in Canada.

The home of most basic research we believe should be in the universities—this kind of research is the responsibility of universities. This is not to say that basic research should not be done outside the universities; it is clear and it is so stated in the report that applied missions do require basic research and the amount of basic research depends on the particular mission. Experience has shown in general that this runs from 10 to 15 per cent of the total research even where there is a clear specific applied mission involved. We see that continuing, but we do see the universities having an important role to conduct basic research where there is no application in sight, research which has cultural value and educational value to our society and without which our society would be destitute from a cultural and educational standpoint.

Nevertheless, while we feel that this kind of research is important and should not be forgotten, it is in fact too easily forgotten in an age when technology and innovation surround us. Even though this kind of research should continue and indeed should be strengthened, we see additional roles for the university in the areas of applied research.

There is no doubt in our minds that the interest in conducting applied research in the universities is growing, particularly in the professional schools. Beyond the area of applied research we would like to see and urge on both the universities and the federal Government a greater involvement by the universities in research which is related to important Canadian goals in whatever field they may be, crime, mental health, urban problems, pollution, transportation, or wherever they may be.

Most of the research which has been conducted in Canadian universities might be called "little science", using the vernacular of the day. There has been very little by way of "big science" in the universities in which groups of investigators in the sciences or the social sciences or both have tackled major problems in an organized way. We feel there is a place for this; we feel that the trained resources in the universities could be used to good advantage in conducting research of this kind of interest to the country as a whole. We propose ways by which, through the initiative of either the government or its agencies, or through the initiative of the universities, these major proposals of the kind which I am suggesting could be undertaken by the universities.

I might say in passing that we see an important educational role in this respect too; much of the research of the future will be in the category of big science, that is, large scale organized research which requires the skills of many disciplines. We think that training for small scale individual research is inadequate for the scientist and social scientist of the future. They do need to learn the methods of big science and they should have the opportunity to learn these in the universities.

Finally, the role for the universities to which I referred earlier is the role in production of manpower. Virtually all of the trained manpower for research purposes for the country's needs must come and traditionally has come from the universities, although to a considerable extent from universities outside Canada.

The graduate enrolment has grown considerably: 1967-68, 25,000 full-time graduate students in Canadian universities; the projection from 1975-76 is 64,000 full-time graduate students in Canadian universities. So it seems clear that there is going to be a demand for training at the graduate level which is large; some people are suggesting that perhaps it is too large. We do not feel that there is evidence to support that fear at the present time. We do feel that the provision of a large pool of highly qualified manpower can and will change the economy of this country in an upward direction.

Mr. Chairman, I think I should stop at this point: without referring to the question of the organization of the councils or the kinds of grants or supports which we propose, or a number of other areas which I am sure will come up in the course of the morning and the afternoon session. What I have tried to say in these few minutes is simply enough to illustrate some of the underlying theme of our report, that the support of research in universities is a partnership and that it does involve the federal government, the provinces and the universities themselves.

I have made some passing remarks to the effect that policies require assessment of merits and I hope we will have an opportunity of expanding on that during the morning period.

We have indicated in our report and I have indicated briefly in my remarks that we feel there is a need to create opportunities to achieve a healthy balance within the country's universities in respect to research.

Finally, we feel that Canadian university research can and should be broadened to include greater attention to problems related to Canadian goals.

The Chairman: Thank you very much, Dr. Macdonald. I suppose we could now start the discussion period, with the intention of adjourning around 12.30.

If we have to continue, I think we should start again at 2.30, rather than at 3.30 as announced.

Hon. Senators: Agreed.

The Chairman: Just before we start the discussion period from the floor I would like to ask a brief question which intrigued me when reading your report: Why did you not pay more attention to the industrial sector in relation to universities and research in universities?

Dr. Macdonald: Primarily, Mr. Chairman, because it was not included in our terms of reference. We were charged with examining the role of the federal government in support of research in Canadian universities. There were many times when we were very much tempted to make exceptions with respect to the relationship of industry to the universities. It is very important; every member of the committee feels that this is important and there should be greater opportunities for improvement of the interface between industry and universities, but it was simply beyond our terms of reference.

The Chairman: Thank you, now we will start, as agreed, with chapter 5. Senator Grosart?

Senator Grosart: Mr. Chairman, I should like to make a short general comment on the impression that the report makes on me. It is understandable that the recommendations have been made from the point of view of what is best for the universities of Canada, and that, of course, is a very important approach to the solution of the problem with which this committee is charged. However, I do get the impression that the main theme is: More political money and less political control. I agree with the first entirely, but not entirely with the second. There seemed to me to be some contradictions—and perhaps understandable contradictions—in the philosophy presented throughout the report in this connection.

I find some of this in chapter 5 where certain recommendations in respect to the funding councils are found. The general theory seems to be that there should not be any kind of centralized council to bring together the in-put of advice into the political decision-making, which I think is the main concern of this committee. The report is more concerned with the out-put of money—the funding support—than it is with this very essential problem of in-put of advice. I am concerned by this suggestion, and the almost cavalier way in which the report seems to brush aside this concept of a centralized research council.

There was once a famous statement that what was good for General Motors was good for the United States. I think there is probably some truth in the

statement that what is good for the universities is good for Canada, but that is not entirely so. There is another viewpoint, and that is the one with which we are charged.

I wonder, Dr. Macdonald, if you would indicate what you and your committee would see as the balance between the use of federal public funds to support the university concept, as you see it—and with which I agree—and, on the other hand, the use of the universities to support R & D in terms of public goals? These are obviously two different, but not necessarily opposite, concepts. Where is the balance? Do you see public funding merely as a way to upgrade the whole research effort in the universities, or do you see the universities having a responsibility to undertake projects orientated to public goals which they may not even like? I am not talking now about the defence situation, because that is a particular case, but there are others. Where do you see the balance here?

Dr. Macdonald: Mr. Chairman, I would like to address myself to these comments of Senator Grosart, and I think that Dr. Dupré would also like to make some comments about them. He began by commenting that he interpreted the report as suggesting we are seeking for the universities more money and less control.

Senator Grosart: No, I said more *political* money and less *political* control. There is a difference.

Dr. Macdonald: Very well. Actually, throughout the report, I think, we do indicate that we see a need for a great deal more control of the dispensation of money than in the past. In a sense, we are calling for an adjudication of all funds that are distributed, and for an end to the provision of general funds to universities, such as the 7½ per cent grant that has been traditionally provided to the president of the university from the National Research Council, and such grants as those from the Department of Forestry to the deans of forestry schools and from the Medical Research Council to the deans of medical schools. We are suggesting that these funds could be used more effectively on the basis of an adjudicated proposal in which the merit of the proposal, not only from the standpoint of its intrinsic merit but its meaning and usefulness to the whole field of research in Canada, is reviewed.

So, our approach to this has been to provide additional and better means of control over the expenditure of these funds.

The Chairman: But they were relatively small amounts, as compared with the sums of money made available in the form of grants?

Dr. Macdonald: Yes, that is quite true. For example, the 7½ per cent that is distributed by the N.R.C. is 7½ per cent of the total direct money which has been distributed, so it is relatively small. But, even here we are suggesting that the control should be greater. Furthermore, we have proposed a number of ways in which we think the adjudication process itself in respect of the bulk of the funds that go to the universities can be improved, and should be improved.

You are questioning whether there should be a central agency, and suggesting that we have perhaps dismissed this idea too casually. We certainly did not intend to be casual about it. We did consider the possibility of a central agency. We found little support for this across the country, in either Ottawa or the universities, although the proposal was made once or twice.

I think it is important here to remember that we are not dealing simply with science in our report. We are dealing with research. We were concerned, and gave weight to the fact, that there are very great differences in the problems in respect of support of scientific research and research in the humanities. We found that these differences are sufficiently great that separate agencies to manage the funds for the very different purposes would be a more efficient way of handling this.

We had no special brief for the three councils except that they represent Canadian historical development, and we felt that three councils, in fact, can cover the whole spectrum of needs of university research if their terms of reference are changed.

Let me come to your question about the balance of funds for university research versus funds for public goals. We deliberately did not make that judgment because it is a judgment which we feel is a political judgment. It is the responsibility of the politicians of this country to decide what this balance should be.

We made it clear that we feel there is an important role for the Government in supporting universities for their own sake. However, we do feel that there is an important role for the universities in supporting research which does relate to public goals, that that role has not been exercised, and that it should be exercised in the future to a considerably greater degree than it has been exercised in the past. I should say that this is not a view that was universally accepted within the universities. When we discussed with some of the university personnel, including the presidents of universities, the idea that universities should engage more heavily in contract types of research, and in undertaking major tasks for the Government of Canada, there was resistance to it. Traditionally the fear was that the universities would become a vassal of government if this were to happen. This is a fear we do

not share and one which is certainly not the consensus of the academics. There are many academics across the country and many university administrators who feel that there is an opportunity and a need, and that the universities should be used more effectively.

In order to come more specifically to the question of what the balance should be, the only evidence that I can put before you is the evidence of the United States in the publication on basic research and national goals, in which Harvey Brooks referred to the fact that, historically, the amount of support for basic research in that country has been about 9 per cent of what is provided for R & D. I think it would be fair to say that he and his colleagues felt that that was perhaps a reasonable percentage. The percentage in Canada at the present time I would say is probably about 10 per cent. If one looks at the fact that we are now at a level of around \$100 million in support of research in universities and one makes the arbitrary judgment that this is essentially basic research in universities, that is a little unfair, because there is a significant amount of applied research. If one compares that to the total R & D expenditures in the country of roughly \$1 billion, we are talking about 10 per cent. My own personal judgment is that that balance is probably reasonable, but I do feel that the universities could be much more heavily engaged in research related to public goals.

Senator Grosart: You seem to place . . .

The Chairman: Before you go on, senator, could I know at this time how many senators would like to ask questions in regard to chapter 5?

Dr. Macdonald: Mr. Chairman, Dr. Dupré may wish to add to my answer.

Senator Grosart: I have about two or three questions.

Dr. Stefan Dupré, Director, Centre for Urban and Community Studies, University of Toronto: Senator, I have very little to add to Dr. Macdonald's reply to your question. I might just perhaps try to underline the extent to which we were conscious of that delicate question between political money, on the one hand, and political control, on the other. It is our concern with this equation, among other things, that led us to re-examine the particular organizational status of the Canada Council as it stands at the moment. As honourable senators know, I am sure, the Canada Council is not any kind of a governmental agency.

The Chairman: It is becoming more and more so.

Dr. Dupré: Precisely. It is not any kind of a Crown corporation, and looked at in its historical context I suppose this probably makes a good deal of sense

when you bear in mind that the Canada Council was originally equipped with an endowment fund, the annual proceeds of which would be spent for research support.

Since 1965, as we know, the Canada Council has had to rely more and more on annual appropriations from Parliament. This, among other things, suggested to us that perhaps the organizational status of the Canada Council merited re-examination in this light, and warranted a suggestion such as the one we have made, namely that regularized status as some kind of a Crown agency deserved consideration, precisely because of the importance of the balance in this equation between money and control.

May I pick out a second part of chapter 5 in order to illustrate our concern over the money-control equation? I would say again that this played a certain role in our dismissal of the single council of the form of research support in this sense. One valid criticism, in my view, of the single council mechanism, is that it may create a situation where too many important decisions as to goals, priorities and so on may come to be taken at the infra-political rather than at the political level, where again a concern for the balance between money and control might suggest such decisions should be made. I simply want to say that these two particular examples out of chapter 5 indicate our own personal concern as a group over the necessity to take into account the control factor when you are looking at the expenditure of public funds.

Senator Grosart: I think it is understandable that almost everybody wants to get away, as far as possible, from political control in the sense of having to live with annual appropriations under the Estimates. Our whole trend of political mechanism, as it develops, is in that direction. I am not sure it is a good trend. It runs counter to some of the basic concepts of the control of public funds by Parliament. Perhaps I say this because some of us spent a day at MIT recently and some days in Washington.

The Chairman: You spent some time at Harvard too.

Senator Grosart: Oh, yes. We spent a day at Harvard, but personally I was very much impressed with the MIT approach, which as you know, leans over on the side of technology and innovation, as the famous story of route 128 suggests.

I see a concern here again in this business of political control. To take a sentence out of your chapter 5, on page 98, you point out quite properly, "There exist widely different attitudes and viewpoints among the major divisions of the scholarly and scientific community." You seem to suggest that this is a reason against the single agency. My view is that it is one of the best reasons in the world why

there should be a single agency, from the political point of view, because the decision-maker, as you point out again on the same page, is the Cabinet operating to some extent through the Treasury Board. Without a single agency feeding into them a consensus or an over-view of the claims of universities and the claims of various disciplines, how is the political decision-maker going to make his decisions if he has to sit down and set the viewpoint of this discipline against the viewpoint of that discipline? In other words, how can he equip himself to spin off the probably quite legitimate requirements of this council or that council—and you are suggesting a good many research councils. Why do you reject the idea of a central co-ordinating body? You, yourselves, point out, for example, that you have traced 41 different departments and agencies of Government that are funding research in universities in one way or another. Surely these have to be brought together. It seems to me that a case can be made for two levels of centralization of the decision-making input of information. One can be scientific, the other political.

All our evidence, all my reading, seems to indicate to me one thing: scientists want scientific control of the decision-making, but politicians are almost forced by the existing system and their responsibility to the public to insist on maintaining control. This means pre-audit, post-audit, technical assessment, and so on.

If you leave that out completely, how would your system work in terms of the input of the necessary decision-making information to the political level which as you say makes the final decision? How would it feed in?

I appreciate the fact that this was not your main concern . . .

Dr. Macdonald: It was one of our concerns.

Senator Grosart: . . . but you have done a lot of work on this and I am particularly interested in the opinion you have on this, that is, on the feed-in.

Dr. Dupré: As Dr. Macdonald has pointed out, this was one concern that we addressed ourselves to and devoted quite a bit of our resources to.

In terms of input that we see going into the decision-making system, we of course look to each of the three councils to make its case when it presents its estimates before Treasury Board. Here to us is a vitally important input of information, because presumably the councils, like any other Government agency, would prepare their estimates, substantiate them and defend them to their best ability.

At this point, note that the inputs that we are providing are the views of three Government agen-

cies, one dealing with natural sciences, one with the health sciences and one with the social sciences and humanities.

The inputs of course do not represent a consensus among the three agencies, and at this stage of the game I suppose that the view that we may be said to take of the political system, of our political decision makers, is that we look to them to go beyond the registration of consensus into the mediation of competing group claims, which of course one can say is as legitimate a function of a political system as the registration of a consensus.

We look to the political system, to our political decision makers, to adjudicate, with the support of their administrative assistants, the question of balance among the various major segments of the research in the natural sciences and engineering, in the health sciences, in the humanities and social sciences.

We have attempted to provide our political decision makers, in their mediation of these competing claims, with assistance in the form of a committee that we have called the Canadian Universities Research Advisory Committee.

The Chairman: I said that you were knocking at the door, but you had another group being in, indoor, in the Treasury Board. You do not take too many chances.

Dr. Dupré: That is right. We are looking here to a committee that will provide advice to those who are mediating these particular claims, rather than look to a single council that will present them with some kind of consensus—heaven knows what—that has been reached in house.

Might I say, incidentally, since your visit to the United States was mentioned, that one thing which has impressed me about the American system, as a student of American science and Government, is the extent to which one of the divisions in the scientific community, in terms of interest levels of funding and so on, has been brought home very clearly to us by the American system, and I refer to the division between the health sciences on the one hand and the non-health sciences on the other hand.

Senator Grosart: We always have to remember that under our system we do not have the congressional power over appropriation, which goes hand in hand with detailed examination and assessment of scientific and technological programs and projects. We have to live with that limitation for the time being. Some of us hope that, in time, our committee system will be strengthened to the point where we would get this particular kind of assessment which

would fill the great gap which some of us have discovered in the evidence we have heard.

My final question, Mr. Chairman, so that you can pass on to somebody else, is this. The report would reduce the consensus centres in this area to three. You started with 41. What about the other 38 departments and instrumentalities of Government? Do they have to go through the three agencies? Are you really recommending such a complete flip over in our whole system of government organization?

Dr. Macdonald: Mr. Chairman, quite the contrary. To begin with, we suggest a division of these two goals of the federal Government, that is, the goal of supporting research in universities *per se*, for its own value, and the goal of conducting research which relates to other purposes of the federal Government.

We believe that the organizational arrangement should be similarly divided. We are suggesting, in respect to the goal of supporting research in universities, we need councils that are devoting their energies and resources to that purpose, and those are the three councils.

When it comes to the 39 or 40 other agencies of Government which do support universities research, according to our investigations, our view would be that this is an area where centralization would be damaging. It is not useful to try to establish an overall policy for science that applies to all of these entirely disparate objectives of Government.

The Chairman: Disparate, entirely different.

Dr. Macdonald: Yes. For example, the problems that are involved in pollution, which are involving political scientists . . .

The Chairman: But take biology, in the field of forestry, fisheries, agriculture, for example.

Dr. Macdonald: If one is seeking to achieve specific applied goals, then there is a difference in the kind of research and effort which is made.

There are two levels of decision here; one is the political decision. What goal is one after? What does one want to do in agriculture? Is the object to improve the production per acre in a particular crop? If that is the objective, there are various ways of looking at that goal; they are not all scientific, although some are scientific.

Once the political goal has been determined—and we believe that should be determined by the department and agencies under the aegis of the politicians, that is, those who are responsible for the overall goals of the country—then there is in the agency a decision as to

the role of science and social science. That is an expert decision. How much can we put into the accomplishment of this goal through science out of our total resources? How much of it should go into the development of services, as opposed to scientific investigation? How ripe is a particular field for scientific exploitation? Are we still at a stage where we do not have enough basic information that we are able to conceive a scientific program to accomplish the goal, in which case one would reasonably conclude that there may still be a need for a greater input of basic research?

What we are suggesting is that the scientific goal should be tied to the political goal in each case and that there should not be a single, uniform science policy.

The Chairman: What about departments which have only a scientific mission, such as forestry? There is no political responsibility; it is only research. We have been told that in the Department of Energy, Mines and Resources about 95 per cent of the staff is directly or indirectly engaged in research, that there is no political mission there.

Dr. Macdonald: There is a political mission; there is the strengthening of the forestry industry in Canada. That surely is a mission. In the case of energy there is the development of energy resources in the country. Similarly, that is true in the case of mines.

These are political missions and to some extent these are accomplished by science. Of course it varies in different departments. In some departments the scientific input would be minimal; in other departments it might be the major activity of the department. We see nothing about this that is incompatible with first deciding what the political goal is and then harnessing science to that particular political goal.

Senator Grosart: Mr. Chairman, in conclusion may I just clarify my viewpoint. It is very easy to say that all that has to be done at the political level is to set goals in science or anything else, but the fact of political life is that politicians are judged and are required to account not merely on the basis of how good their philosophy was or how good their goals were, but how they spend the public money, item by item. That is to say that accountability is the essence of the political system as we know it. That is why I am somewhat concerned about this tendency to say, "Let us get away from accountability; let us get away from annual estimates." Sure, they are a nuisance and nobody likes them. They have their limitations, but this is the method that we have developed and that seems to be the best method of assuring that there is technical assessment and technical audit of the spending of public money.

We hear over and over again that the politician just has to set goals, science goals and priorities. He is not judged on this at all; he is judged on how he spends that money. In other words, it comes down to a strict cost-benefit ratio of accomplishment.

Dr. Macdonald: Senator, we would fully agree with that; we do suggest that it is important for the politicians to be getting advice and information on which they can make their assessments, not only about accomplishment but before that issue has been reached, the question of feasibility. These things do have to be assessed by the politician. We are suggesting a more rigorous examination of the research programs of departments by Treasury Board each year to see in what ways the scientific effort of the department has related to the goals and in what ways it should strengthen the goals.

We apply that in particular to the support of any university research by these departments; we feel that the departments should be making their judgments basically on the basis of the relevance of the research which is being supported in the university to the department goal, not to the university.

Senator Grosart: In another part of your report you indicate that you do not want the politician to be able to go beyond the inside accounting of the university, that to me is an extraordinary recommendation. It seems to mean that the Auditor General, Parliament, a parliamentary inquiry or a regular, normal audit should not be able to go into the last detail of the expenditure in a university.

Your theory was tried in the Winter Works Program and it did not work. That was in respect to a provincial audit, not a university audit, I say that not to cast any aspersion on the validity of a university audit, but to say that the person who is spending the money is not the best reporter of the validity of the spending.

Dr. Dupré: Senator, I am sorry if we left the impression that we would in any way exempt the universities from standard federal audit practices. We addressed ourselves to this problem on page 171, which is where our recommendations concerning audit appear. We point out at the bottom of the page that:

With very few exceptions, federal agencies currently accept, without supporting vouchers, a university's accounting of grant or contract expenditures, subject only to the university's own annual audit. The agencies retain an over-riding right to audit university accounts but it is understood this right will be exercised only in exceptional circumstances.

Our recommendation concerning audit, from the way I read it, is that basically we would like all federal agencies to adhere to the present guidelines that are used by a majority of such agencies.

Our recommendation states at the outset quite clearly that we would have the federal Government retain the over-riding right to audit the appropriate university accounts when circumstances clearly warrant, but we simply go on to say that as a matter of normal practice . . .

Senator Grosart: Would you read the rest of the quotation?

Dr. Dupré:

While retaining the over-riding right to audit the appropriate university accounts when circumstances clearly warrant, all federal agencies accept, without supporting vouchers and subject only to the university's own internal audit, university accounts of research project expenditures.

Senator Grosart: I can only read those words as saying one thing; however, it is not a major point.

Senator Cameron: I think in practice, Mr. Chairman, the auditing procedures within a university would be quite acceptable, even to Max Henderson, the Auditor General. That has been my experience with university grants of this kind.

Senator Grosart: I am not questioning that; I am merely saying that the general recommendation that you close the doors on outside audits is at odds with the overall political responsibility for expenditure of funds.

Dr. Macdonald: Perhaps before we leave this point, Mr. Chairman, I should come back to what may be central to the comments of the senator, and that is the question of whether there should be some single central overall agency determining policy. It seems to me that that separates further the political judgment and the political decision from the scientific decision. You are interposing then between the politician and the scientists in the individual departments of government a new agency which would be a powerful agency and which would determine policy for science, and it would not be a political agency.

Senator Grosart: You have put the word "determining" into a context in which I would not have put it. I would have said "co-ordinating" or "recommending", but not "determining", because after all the determination can be made only at the political level.

The Chairman: It would be a clearing house.

Senator Grosart: I am not suggesting that there be a science agency that determines policy—far from it.

The Chairman: That central agency would not make grants?

Senator Grosart: No.

Dr. Macdonald: That is a useful clarification. Then, are you not really talking about the function of the Science Council?

Senator Grosart: No, because I do not know what the function of the Science Council is. I have not been able to find out.

Dr. Macdonald: Are you not really talking about the intended function of the Science Council?

The Chairman: The Science Council is advising on science policy in general, but it has nothing to do, in my mind, at least, with the allocation of funds or with finding out what is to be spent on the physical sciences each year.

Dr. Macdonald: Mr. Chairman, you are using the word "allocating" where I use the word "determining". It seems to me that the question is: Are you going to get from such an organization advice, or are you going to get a determination of what actually is done?

Senator Grosart: This will depend on how good that agency is.

Dr. Macdonald: Our view is that it would not be good for the country to have a central agency determining what is done in terms of science in the very large number of departments.

The Chairman: It would never have the power to decide this because no such agency would have that power.

Senator Bourget: Would not that be the role of the intercouncil co-ordinating committee, the establishment of which is the subject of recommendation number 6.

Dr. Macdonald: The purpose of this committee, Mr. Chairman, is primarily to deal with issues of jurisdiction between the councils, and particularly to deal with proposals emanating from the universities that do not fall into the terms of reference of the council as it is at any particular time structured. We have an example at the present time in the fields of archaeology and psychology. Do they belong in the social science area or the natural science area? We believe there will always be problems of this kind. One could make a division today of all the areas within the university and be content that he was covering every area, and I am sure that six months would not pass by before some enterprising person would come forward

with a proposal that did not fit any of the terms of reference. We are suggesting that an intercouncil co-ordinating committee would act as a clearing house, and would route proposals to new areas where the support of a particular council is required.

Dr. Erich Vogt, Professor, Physics Department, University of British Columbia: May I add to that by pointing out that Recommendation No. 10 concerns a Canadian universities research advisory committee, which Dr. Macdonald mentioned earlier, and the chairman referred to this as providing an opportunity for the universities not only to knock on the door of the Treasury Board but to push the Treasury Board from inside. I think that this committee, as envisaged in our report, would be entirely an instrument of the Treasury Board, which would give confidential inside advice to the Treasury Board. It would not be an instrument of the universities within the Treasury Board.

The Chairman: I would not serve as a member of this council when I knew that other university people are near the Treasury Board, and advising it in secret.

Senator Cameron: Mr. Chairman, we are all aware that the purpose of this Senate committee is to try and devise a science policy for Canada. We have heard a lot of submissions as to what should be done, and what is wrong now. From our discussions and hearings we have learned that there is a great deal of duplication, and there is no clear-cut inventory of what is going on in Canada.

Dr. Macdonald, you have been charged with the study of the role of the federal Government in support of research in Canadian universities, but I am wondering if we must not see this in terms of the total program of research in Canada, and of our total in-put as a nation into research. So far we have not been able to get a complete picture of what is going on. You have dealt with what is going on in the universities, and you have made recommendations as to how this might be done, but we still have not an answer after 15 months as to an overview of what is going on in Canada. Perhaps we cannot get it.

We asked this question in Washington the other day, and found that although they do not have the total picture they do have a pretty good idea. Because of their congressional system, which is so different from our system, they do have a more accurate check and a more accurate picture of the total in-put into research as a nation than we have.

Now, you have been concerned with the role of the universities and the role of the federal Government in supporting research, but that is only part of the total package. Suppose we accept the recom-

mendations that you have made that there be three councils. How do you envisage the implementation of the recommendations that would come from the three councils, even when they have been vetted by this supercouncil or this advisory committee? How do you get this ready for the cabinet? Have you given some thought as to how this will be carried right into the cabinet committee for execution?

Dr. Macdonald: Senator Cameron, I think, if I understand your question correctly, that you are trying to get at the problem faced by the cabinet, namely: How much of this funding should go to the support of research in universities through the councils . . .

Senator Cameron: That is one thing.

Dr. Macdonald: . . . versus how much should go into the support of health activities or forestry activities, or agricultural activities, or whatever it may be, depending upon what the goals happen to be at a particular time. Housing, for instance, could be included in this. These choices for a government are what we refer to in our report as incommensurate choices. They are not alternate ways of doing the same thing. They involve subtleties and priorities, and that is why they are political decisions. In order to make those decisions the Government requires the best advice it can get about the potential contribution of research to those decisions.

We have to again come back to what I must emphasize, that there are two different kinds of goals in respect to the universities. One is the support of universities, themselves, because it is important that Canada have strong universities. Here I think that governments can decide what percentage of its total resources for research that it wants to put into university research of that kind. We talked about the fact that it is probably of the order of 9 or 10 per cent at the present time. That is a political decision. It relates to the number of good people that are available and it also relates to the experience of other countries, how much one can use in this way. It relates to the quality of the adjudication process and how rigorous it is? Are we supporting really meritorious research or supporting a large amount of research with inadequate funds which is not research that is very useful or moving us forward at a basic level or any other level.

The second area, of course, is the area of research, which is related to specific political goals, and here I think the kind of advice that Cabinet gets should relate to the political goal and possible input of research in this area. I do not think that Cabinet needs to concern itself with the decision within a department, how it wants to accomplish the research objective, whether it wants to do it through its own

intramural resources or wants to do it by contracting it to universities or some other private agency. This is a decision which is a practical one and one which has to be made by the department on the basis of where they can get the best buy.

I think that the Cabinet should be concerned about using good practices and that they are attempting to get the best buy in the research which they obtain. What Cabinet really wants to know at this level is whether the research that is being proposed by the department is forwarding the goal of that department as set forth politically by Cabinet.

I think it is fair to say that the kind of advice which government in Canada and perhaps government in most countries has had, has not been of such high quality as one would wish in these areas. The Science Council, I think, is an attempt in Canada to move in the direction of improving that quality, but I would again question whether we will have better decision making by trying to centralize the area of advice to government on the overall capacity of science when we have such a very large number of different goals.

I could take an example from another country. Our input into research in the field of defence in Canada is entirely different, in proportion to the total from that in the United States, but our goals are entirely different. Now, one could argue that because the United States puts a very large percentage of its research into defence and that has been highly productive in terms of technology and innovation related to defence, therefore, we could do it. But does that relate to what we want to do in this country? I come back to the view that the decision about what one is going to do scientifically must be related to what one is trying to accomplish politically.

The Chairman: That is one aspect of it. I am beginning now to understand what your purpose was here. In other words, if I understand you, you are not proposing any kind of change in the mechanism of allocating funds to universities. You are proposing that these three councils merely, with the intention that they will make money available, as you say in your first recommendation, "will encompass all disciplines recognized by Canadian universities." You do not propose any kind of change in the present mechanism for allocating money to universities.

Dr. Macdonald: Better advice.

The Chairman: Except your small group and the Treasury Board.

Dr. Macdonald: Better advice to politicians and much better management and practice within the agencies.

The Chairman: That is not a change in the mechanism, that is only a recommendation for these agencies. I understood that some years ago, and I think it was last year, there was great complaint from Canadian university teachers that there were too many federal agencies involved in giving grants to universities and there was great confusion, because they did not know where to apply. Do you remember? I remember this kind of recommendation that was presented at some stage to the Government.

Dr. Macdonald: Well, our feeling is . . .

The Chairman: You have decided to ignore that request from Canadian university teachers.

Dr. Macdonald: I am quite sure that does not represent a consensus of Canadian university teachers. Our feeling is that pluralistic approach related to the specific goals, which one is trying to accomplish, is a healthier and better system.

The Chairman: You, of course, argue, and quite rightly so, that there should be a micro-approach to these problems of allocating grants. I maintain there should be also a macro-approach, because otherwise we are bound to arrive at all kinds of imbalances, as we have them at present. For instance, we are told that in the field of scientific manpower training programs, through the generous support which has been forthcoming from the National Research Council, we are about to produce a surplus of PhDs in Canada in the field of science and engineering. At the same time, we were told by the President of the Public Service Commission that the federal Government was now trying to find at least 400 economists and they could not find them. This kind of micro-approach, allocating responsibilities to specific missions does not always work for the public good.

Dr. Macdonald: It is bound to produce imbalances if there is no macroscopic view to complement that micro-approach.

Dr. Dupré: I might say, Mr. Chairman, in terms of implementing the macroscopic view, as you so felicitously phrase it, what the councils—if it is clearly recognized that the councils, themselves, represent an important goal, namely a goal of a balance of research efforts and research for its own sake in universities—become one of the important tools to which the federal Government can turn in implementing a macroscopic approach.

The Chairman: These councils exist now and through their separate existence we have produced imbalances, but you do not propose anything which could correct or review that situation. That is my point.

Senator Bourget: Except the intercouncil committee they may set up.

The Chairman: The Treasury Board. We have been told by the Treasury Board people that they look only at the increment and at new programs. This was repeated to us when we heard some people from the United States Bureau of Budgets. They described their approach to their science budget as the increment approach.

Dr. Macdonald: My understanding, Mr. Chairman, is that the Treasury Board in Canada is moving toward the program budgeting approach, which is not the incremental approach and this will affect sciences, as well as all other areas.

The Chairman: I could argue with this.

Dr. Ernest Sirluck, Vice-President and Graduate Dean, University of Toronto: I wonder whether it is true that the report contains nothing that answers to your problem. I do not think there is a complete answer but there are two strains of influence that I think are worth mentioning. At the federal level of things, we put a great deal of emphasis on development grants which ought to answer a felt need, so we do not think that the right place to make a decision about relative investment is at the micro level of decision, at the level of the individual members of university staffs, but rather at the federal level, and that it should be made with universities as a whole.

The second strain of influence belongs, in our view, properly to the provinces, that is to say, the way in which universities will develop is very closely related to provincial responsibilities and above all, the most sensitive, education.

I would not expect much success from federal dicta saying that the universities will now turn away from the production . . .

The Chairman: I was not speaking about that at all: I was speaking about the control and supervision of federal spending.

Dr. Sirluck: Yet what really is the distinction between those two things?—It is perhaps less complete than may appear, because what a university does is to enlarge its commitment, expand its effort, in areas for which it can get support. And if the federal sources of support are heavily in the direction of engineering, the university will develop a very rapid interest in engineering. The imbalance that you speak about, Mr. Chairman, in the present Canadian scene remains to be demonstrated and, even if it is demonstrated, it may be very temporary.

For some years, universities have been asked to run flat out to produce every kind of high level manpower effort; and if it is shown, as the report of the NRC suggested, that it has achieved an adequate supply in some science fields—which I very much doubt . . .

The Chairman: You are not alone.

Dr. Sirluck: . . . there is a self-correcting mechanism. Departments in those fields will begin to find difficulty in placing their products and will begin to slow down in their expansion.

The Chairman: Five or ten years later, perhaps.

Dr. Sirluck: Not really. I think, much sooner. At the provincial level we have evidence now in, say, the Departments of Chemistry in the Province of Ontario attempting to control further growth in relation to opportunity already—although the first signs of overproduction, if that is true, only came to attention about a year ago.

Furthermore, I am extremely skeptical about these data. They take no cognizance, for example, of such factors—or take only a limited cognizance of such factors—as the export of people who only came here temporarily, the export, continued and growing export of Canadians, the capacity, that Dr. Macdonald mentioned earlier, of the Canadian economy to import, to absorb here more people, if they are available, to its benefit.

The Chairman: I will win this argument, anyway . . .

Dr. Sirluck: Undoubtedly.

The Chairman: Because if we do not even know that there is a balance in our programs, that is as bad as if we knew there were imbalances.

Dr. Sirluck: We should know, but I do not think it would be advantageous to substitute draconian controls from the centre for the several measures that are anticipated in the report. I think they are interacting and complementary measures.

Dr. Macdonald: Mr. Chairman, I think that the question which you are raising is of profound importance from the philosophic standpoint, the kind of freedom which we want to have as Canadians to make choices as individuals. We have not had a planned economy in the sense that we are deciding how many chemists we need, or how many economists we need.

The Chairman: I am against that, too.

Dr. Vogt: Or how many politicians.

The Chairman: But when there is federal money being spent in one field where we are producing a surplus and at the same time when we have great scarcities in other fields, I think I do not call that planning to spend less in the first field and more in the second, it is just plain being rational. If you identify reason with planning, okay, but . . .

Dr. Macdonald: I think the responses which will be made by our whole society to a surfeit of manpower will be the same kind of responses which we have now made in the last few years to shortages in manpower. We have made the effort and we are producing people. We strongly urge on all governments the production of better information on our manpower requirements than we yet have. If we have such information, and if Government can produce such information, the responses—the responses of the universities, the responses of the individuals, the responses of individual faculty members, the responses of the students—will be better. We believe that students, if they recognize the areas of shortage, or areas of surfeit, would make judgments accordingly. That is the way we should be trying to make our judgments. What we really lack is information about our manpower requirements.

The Chairman: Yet we have just been told that when there is money available, the university will do it.

Dr. Sirluck: That is exactly the point. If the negotiated and strategic development grants that we propose in this report are successful, they will be exactly answerable to needs in the society, of the kind that you have identified. If we create a shortage of economists, then the universities would be encouraged by the Humanities and Social Sciences Council to aim much higher in that field. But if they accepted this, it would be with the participation of their provincial paymasters. And I think that the conflict has to be avoided between federal goals and provincial goals, and I think the right way to avoid it, as far as the universities are concerned, is through negotiated grants.

The Chairman: I do not want to monopolize this, but I might come back to it at the end of the day. I do not want to frustrate my colleagues too much.

Senator Cameron: Dr. Macdonald and associates, you have had specific terms of reference in preparing this report and have come up with certain interesting ideas. We, too, as a Senate committee have terms of reference, and this involves coming up with a science policy for Canada that does not mean only what we should do but how it should be done, that is, the machinery whereby it should be done. I maintain that before we can answer the question of what

should be a science policy for Canada and how it should be executed, we must have a picture of the total resources going into science in Canada. That is, what is being spent in Canadian universities, what is being spent in the private sector—because this involves manpower, equipment, and what goes with it. We have not got it so far.

It may not be possible to get it entirely accurately but I would think that somewhere in this picture we must have this national inventory of the input in science and development. It is important, for another reason. All the information we have, as educators, is that the budgetary requirements are going to escalate at a fantastic rate if we are to maintain our position in this technological age. This again involves the necessity of understanding not only what the Government is spending but what the private sector spends. We have not got this. I insist we must have it in order to evolve in our best judgment what should be a science policy for Canada and also the machinery for its execution.

Dr. Macdonald: We would agree, Senator Cameron; this information is not available. It is needed; I think we have provided it in the university sector.

Senator Cameron: Yes, indeed.

Dr. Macdonald: I think a similar study is perhaps needed in the area of industry, the private sector. Perhaps there needs to be a more careful look at the performance of government, not just the federal government but all governments in Canada, in the area of research.

There could be two additional studies done. Beyond that we would strongly support the view that there needs to be a continuing collection of data of this kind on an annual basis.

We had grave difficulties in obtaining much of the information which is in this report, simply because there has been no systematic gathering of it over the past years. We think the kind of information which is in this report should be gathered regularly, much of it annually. The same thing applies in industry.

Senator Cameron: Have you given any thought to the kind of machinery we need to give this national inventory of research input?

Dr. Macdonald: I think the answer is that we have not thought about it, but we could perhaps try to think about it right now.

We do have the beginnings in the Science Council and the Science Secretariat, which has conducted a number of studies, but these are static studies of what a situation is at a particular point in time.

It would be quite conceivable to develop machinery and an organization charged with the regular annual collection and analysis of data of this kind.

There has been a tendency I think in this country to suggest loading tasks of this kind and many other tasks as well on DBS; it may be wise to establish agencies that are charged specifically with doing this on a regular basis.

Senator Cameron: I would think it requires a specific agency but I am wondering why has the Science Council or the National Research Council or any of these other agencies not done it? I think this is essential to the whole question of where we are going in Canada.

You suggest this inter-council committee. How do you see the role of that committee in carrying the recommendations to the Treasury Board, or whatever the agency is going to be that is going to implement it?

Dr. MacDonald: Are you talking, Mr. Senator, about the inter-council committee, or are you talking about the Canadian universities research advisory committee, which gives advice to treasury?

Senator Cameron: No. You suggested that you have three councils and I have no quarrel with that; then there is an inter-council advisory committee.

Dr. MacDonald: The inter-council advisory committee is to coordinate the work of the three councils. Its advice is direct to the councils. On its membership is the president of each of the councils and whatever colleagues the councils themselves should choose.

One of their tasks, and I would expect the councils would assign this to them as well, would be to determine the distribution of applications in new areas, who is going to handle them or if it is a multi-disciplinary proposal, what councils jointly should handle them.

If it is a major proposal it may be that this committee would be involved in the establishment of an appropriate ad hoc review committee which would represent the three councils and perhaps, other agencies and organizations as well, to give their views, but the advice is to the councils themselves.

Senator Bourget: But they would not advise Treasury Board at all?

The Chairman: No. This is recommendation No. 6, as opposed to recommendation No. 10.

Senator Bourget: I understand that, Mr. Chairman, but I thought also being a coordinating committee of

the three councils they might have their say also and give their advice to treasury Board, because with your recommendations, as I see it, it is only the university advisory committee who will be inside.

Dr. Macdonald: I think it is quite possible and perhaps even likely if the councils establish such an inter-council coordinating committee that they might choose to give advice to Treasury Board about what should be done by way of funding the councils themselves. This would depend on the question of whether or not they could reach some agreement.

Senator Bourget: It seems to me that it would be a logical role for the inter-council committee.

Dr. Macdonald: If they reached agreement they would be in a stronger position in putting forward recommendations of that kind. On the other hand, if they cannot reach agreement that is what the confidential committee is for, to give Treasury Board some help in reaching logical decisions.

Senator Grosart: Do you see these three councils dealing only with the funding and channeling of basic research?

Dr. Macdonald: No sir. All research which is done in the universities under the auspices of the councils—which could be basic, applied or, as we pointed out, major proposals dealing with areas such as urban crowding, pollution etc.

The Chairman: What about research in agriculture in the universities; where would that go in your councils?

Senator Grosart: How do you separate the two? How do you decide which goes into these councils and which stays with the departments?

Dr. Macdonald: Work in agriculture could be scientific and it could be under the National Research Council. There could be economic work in agriculture and, of course, there are people working in the field of economics in agriculture. That would be under the Humanities and Social Sciences Council.

These councils would be responding to initiatives coming from the universities about research which they wanted to do. They would be making their decisions on the basis of whether this was meritorious research which should be done in its own right in the universities. Also on the basis of knowledge of what kind of work is being supported by the Canada Department of Agriculture. The councils would serve here a balance wheel function. In the event that there is a heavy engagement of universities in agricultural research through the Canada Depart-

ment of Agriculture, the councils would respond by diverting a larger part of their resources to areas other than agriculture.

Senator Grosart: But you say at page 97 that your definition of a legitimate discipline is one which is recognized at the university level.

Now we are back to the micro-macro business: does this mean that if no university happens to recognize a particular discipline it cannot be considered by these councils?

Dr. Macdonald: There would be no application if the universities did not recognize it, would there?

Senator Grosart: So this is just another group that does nothing but respond—the three councils do nothing but respond to requests?

Dr. Macdonald: Yes.

The Chairman: But what about the individual departments? A lot of these departments now have grants programs where they only give the money if an application has been received. This is exactly the same procedure as these three councils would follow.

Dr. Macdonald: Except that the judgment here should be on the basis of whether this proposal is something which is of genuine interest to the goals of that department, not whether it is of interest to the university. That is not the point for the department.

The Chairman: So that university people would be able, for instance, if they are interested in doing research on labour problems, to come to the Department of Labour, where they have a small grant program to do that, or they could go to the proposed council?

Dr. Macdonald: Yes.

The Chairman: So again there is no change in procedure in this field.

Dr. Macdonald: Except that here we are suggesting that the Department of Labour should make its judgment on the basis of its goal, not on the basis of wanting to be a sponsor of university research. We think that this role of departments of government as sponsors of university research *per se* as a goal for these departments is not appropriate, and this is an important change in outlook, we believe.

The Chairman: How could you enforce that advice or that recommendation on departments?

Dr. Macdonald: We have suggested that the departments must account annually to the Treasury Board for the ways in which they have funded universities, and show in what way this has forwarded the goals of the department.

Senator Grosart: They do that now.

Dr. Macdonald: Except that it is not a requirement that that be work that is important to the department.

Senator Grosart: If it is not a requirement that the department must justify any expenditure on research and development, then I do not understand our system of government.

Dr. Macdonald: They justify it on the basis that it is important to the university in the training of manpower, but that, we feel, should not be their function.

Senator Cameron: I am wondering if there must not be a limit to the degree of freedom the university departments have in setting their goals. You say that the department will set the goals and carry them out, but I would think there must be some place in our national structure where these individual departmental goals or university goals are related to the national picture.

Dr. Macdonald: Excuse me, Senator Cameron, but I am not talking about university departments; I am talking about government departments.

Senator Cameron: But, again, I keep coming back to this national inventory which is necessary in order to make decisions. We know that the research carried out in universities is not by any means funded entirely by provincial or federal government grants. There are many private grants of one kind and another, and these occupy resources of manpower and resources of space. I think we must have this picture in mind before we can establish a proper national science policy and determine how it should be implemented, and we have not got it.

Senator Bourget: In recommendation No. 3 you say:

The National Research Council be reconstituted so as to have as its sole responsibility the support of scientific and engineering research in universities and related institutions.

How do you envisage the role of the N.R.C. in the future, and what is going to become of its laboratories, and who will operate them?

Dr. Macdonald: First of all, we do see an important, and perhaps more important, role for the laboratories in the future than they have had in recent

years. We did feel that it was beyond our terms to propose specifically what the laboratories should be doing, but we did urge that this receive examination and that the laboratories be related to goals of the country. We suggested the possibility that the laboratories be organized as a series of task forces for specific objectives which might be set by the laboratories, or by the laboratories on direction from the cabinet, or to specific objectives of departments of government. But, we stipulate that these be clearly defined tasks that the laboratories are undertaking, and that they be organized in such a way as to be able to accomplish those tasks making maximum use of the flexibility which would be available to them to group and re-group from time to time, to change the nature of the task, and apply their resources to these tasks.

I think it would be fair to indicate that this view of the role of the laboratories is consistent with Dr. Schneider's view, as President of the National Research Council—at least, that is our interpretation of the comments he made to us, and we support them and subscribe to them.

Senator Bourget: Does it mean that you may have task forces from other universities come down to Ottawa and use those facilities?

Dr. Macdonald: Well, that would be a decision for the laboratories. If they did not have the manpower resources in their own laboratories on a full-time basis they certainly should be able to second persons from industry or the universities to assist in the accomplishment of the tasks. They cannot be undermanned if they are to accomplish whatever task they undertake. We do feel that the division will enhance the opportunity for the laboratories to identify clear objectives for themselves which do relate to Canadian interests.

Senator Grosart: If the National Research Council becomes, in effect, the University Research Council, would we not still need a National Research Council?

Dr. Macdonald: This is the senator's terminology, and we do not hold any particular brief for the terminology that is used here. We suggest that the National Research Council be the agency to fund the universities' scientific and engineering research. We did not name the other group. It could be the National Research Laboratories, or it could be the National Research Council, and you could have some such new name as you suggest for the body to conduct university research.

Senator Grosart: It would hardly be entitled to be called the National Research Council if its respon-

sibilities were limited as you suggest in Recommendation Number 3.

Dr. Macdonald: That raises the question of whether the responsibilities are limited. We would expect that within three, four or five years its responsibilities in respect of support of university research in terms of dollars would have grown to a multiple of the level of the support of the laboratories. In the last year it has passed the level of support of the laboratories. We do not look upon this as small. This is one of the reasons why we view a separation of these two functions as being inevitable, because of the very great growth one can anticipate in the coming years in the university support function.

Senator Grosart: That is a quantitative rather than a qualitative approach to the problem.

Dr. Macdonald: Yes, it is.

Senator Grosart: And to some of us the qualitative approach is every bit as important.

Senator McGrand: I understood someone to say that about 10 per cent of the research money went to basic research. What proportion of this basic research is done by the universities and by the National Research Council? There must be some proportion. Now, is it possible to get the number of these basic research projects that have been undertaken, and a copy of a written document, which a person could read for his own satisfaction.

Dr. Macdonald: I will answer your second question first. The projects that are supported by the Council generally do result in publications, and I think you could get from the National Research Council some indication of the publications. My recollection is that the Council does require the grantees to submit publications, although I may be wrong in that.

Dr. Vogt: There is a very complete annual report issued by the National Research Council which lists all the projects of individuals that it supports.

Senator McGrand: That would be sponsored by the National Research Council. Where would you get that sponsored, by the universities?

Dr. Sirluck: Mr. Chairman, there is no comprehensive list for all of Canada. An increasing number of universities are now producing this kind of information in annual form for their own members. I do not know what that number is, but you could get it. For example, I could give it to you for the University of Toronto. This would be of all sectors and it would be short titles.

The Chairman: Would it be a short list?

Dr. Sirluck: No, it would not be a short list, but a short-title list.

Senator McGrand: Where is the most basic research done, by the National Research Council sponsored by them and their grants, or by the universities?

Dr. Macdonald: Since I used the figure 10 per cent I will answer that. First of all, senator, I do not think you should take the 10 per cent as being a precise figure. I arrived at this by estimating \$100 million in university research and assuming that all of it is basic research, but which assumption is not correct, as some of it is not. I did not take into consideration the basic research which is done by the National Research Council and the departments of Government, which would offset the applied research which is done by the university. That is the way I arrived at the 10 per cent. It is a very rough figure. In general, I would think it would be fair to say that the great majority of basic research is done within the universities.

The Chairman: I would like to ask you another question at this stage concerning these three councils. In the United States they have within the government only one foundation. As a result of our visit there we have not detected any great movement to alter that situation. How is it that in Canada, with a much smaller budget, we would need three councils, whereas in the United States they have only one foundation to do the same job?

Dr. Dupré: I think, simply looking at the American situation, Mr. Chairman, that a second organization may have, understandably at this stage, escaped your purview, and that is the National Endowment for the Humanities and the Arts.

The Chairman: I think the tendency now is to put that in the foundation itself.

Dr. Dupré: As I understand it, the National Science Foundation of course has evolved a quite considerable role in sponsoring research in social sciences. The National Endowment will be more geared towards research in the humanities. In that sense I am pointing out that there is a second body that deals only with the humanities.

A second point that I would bring to your attention is that, of course, organizational peculiarities differ very much between the American system and our own. I would find it difficult if I tried to give a panoramic view of research sponsorship in universities in the United States to exclude from the scene the National Institutes of Health. It happens that the

National Institutes of Health is an integral part of an operating department; the Department of Health, Education and Welfare. This suggests, of course, that one could conceive of the health sciences in this country as perhaps being funded, not by council, but by an operating department of Government. We considered this particular anomaly in the course of our research on this report.

We came to the conclusion that the evolution of sponsorship of health sciences and research in this country, which has been under MRC, a semi-autonomous branch of NRC, warranted the continuation of a council form of organization, taking into account all the circumstances. If you look at the American scene and put down NIH, the National Science Foundation and the Humanities and Arts agency, you have there really three agencies that would correspond, in a sense, to our three councils. Of course, the organizational status of councils is quite different. The other difference, of course, in our scheme is that we would place social sciences along with the humanities rather than putting the social sciences under the umbrella of a natural science agency, and at this stage you get into the intangible sort of judgments that inevitably accompany any kind of recommendation dealing with the Government organization. This was the feeling of the study group and this was, I think, very much shared across the board. For methodological reasons, there are some very valid points to be made for continuing the link between the social sciences and the humanities. Neither can we ignore the long humanistic tradition in the social sciences, which is so much a part of the general Canadian tradition in the social sciences. This seems to speak in terms of what we were thinking of in favour of a grouping of social sciences and humanities under an individual council.

The Chairman: But how would the areas assigned to these three councils, as you say, encompass all disciplines recognized by Canadian universities? You will have the humanities in Social Research Council. This is fairly well defined and then the Health Council, which is again well defined. Do you mean that all the rest of these things or disciplines, which are taught in universities, would come under the National Research Council?

Dr. Dupré: No, I would say, Mr. Chairman, that we have felt that the various disciplines would group themselves under each of the three councils in accordance with some of the recognized affinities that exist, for instance, between law, on the one hand or business administration and the social sciences on the other hand. Of course, it goes without saying that in describing our scheme at this juncture, the importance of the intercouncil co-ordinating committee becomes one of quite critical importance. What do

you do, for instance, with medical sociology or medical economics?

The Chairman: These are disciplinary. Why did you not think of having three main councils divided according to the main disciplines: the physical sciences, life sciences, social sciences, and humanities?

Dr. Dupré: I am not quite sure that I understand, that it is not, in essence, what we have.

The Chairman: Health, of course, is quite an important part of what is usually called the life sciences, but it does not cover, for instance, the research which is done in universities in the field of agriculture, forestry, school officers and biology. It seems to me to be quite restrictive. If this area or this council is restricted to the field of research on human health then by implication all the rest has to go to the National Research Council. Then you have a whole lot of things which can be very remote one from the other.

Senator Cameron: And the duplication goes on.

Dr. Dupré: Then this is a function where we would look to the intercouncil committee . . .

The Chairman: But if you do not start with some kind of definite classification, I do not see how your co-ordinating committee will get out of confusion, because once the major responsibilities of the three councils has been defined, that will be it. Of course, the co-ordinating committee will have to divide the responsibilities between the three councils when they deal with the interdisciplinary questions and problems.

Dr. Macdonald: I think the answer to this question is that we really do not see any ideal classification which is neat and into which everything can fall in a pocket or compartment where it automatically belongs.

The Chairman: That is impossible, but at least there are certain degrees of perfection.

Dr. Macdonald: Then we asked ourselves the question, can the present arrangement serve the purpose satisfactorily, and we concluded that it probably could serve the purpose as satisfactorily as any other kind of arrangement. We would not say, for example, that one would get away from the kind of difficulties you describe by simply dividing along the lines, physical sciences, and life sciences. What does one do with biophysics? You are into a problem there, whatever kind of division you make.

The Chairman: There always will be interdisciplinary problems.

Dr. Macdonald: That is true. This is the reason why you need the intercouncil co-ordinating committee. It seemed to us that we can on an arbitrary basis make decisions as to where a particular area is going to be located. To take the example of social work, it can be decided, and would I think have to be decided, if these proposals are acted upon, where research in social work is to lie—is it in the humanities—social sciences council, or is it in the health sciences council? I think one would want to discuss it with the people involved in this field, to find out from them where they think their research and their future effort will more closely relate, where their affinities will be. But these are, in the last analysis, arbitrary decisions, and we are just finding that the present arrangement is sufficiently satisfactory.

The Chairman: It leaves it that the NRC has all kinds of residual things but they still carry on basic research in for instance, agriculture, or medicine.

Dr. Macdonald: Yes.

The Chairman: It seems to me it might be more desirable if you had at least a division according to the three basic groups of disciplines and then of course you would still have the gray zones. But it seems to me that with that kind of allocation that you have here, you maximize the gray zones rather than try to minimize them.

Dr. Macdonald: You create some additional problems if you try to change the structures which have grown up over a long period of years and if one is going to do that, for example, dissolve the Medical Research Council and establish a life sciences council, with entirely different terms of reference.

The Chairman: Not entirely, it would be just an extension. You may have to expand, because this is the very purpose of your recommendation. We have now to create three councils which will cover all the research activities in the university. This does not exist at the moment.

Dr. Macdonald: That is right.

The Chairman: So some of these three councils will have to extend their scope and activities.

Dr. Vogt: Mr. Chairman, the difference between what exists now and what is proposed is not very great. There are areas like law and education not encompassed at present by the councils, which would be fitted in.

The Chairman: Not because they are not covered by the responsibilities of the councils: it is just because of the fact that the Canada Council has decided that it would not give assistance to those

fields, but it could at present, if they wanted to, as it is entirely within their responsibility to do so.

Dr. Vogt: Mr. Chairman, you are really supporting my argument that at present the arrangement we are proposing is not really very different from what exists at present, that the councils are in a responsive role, but that does not mean that they have to give a certain amount of money to each field, depending upon how many requests there are from the universities. They can still decide to support law, in that field of research, or not to support law, or they can entertain applications.

The Chairman: If the only relation to life sciences and biology and related sciences at the moment is only human health, in the council, then those doing research in biology of fish will have to go to the National Research Council. It seems to me that in research related with human health and related with the biology of fish, trees and animals and all these things—at least if those councils have to devote their attention only to basic research and applied research—there are a lot of common problems in those fields. I do not think it would be desirable to take all these other research problems related to life sciences and put them with the physical sciences.

Dr. Macdonald: These problems of course exist now between the National Research Council and the Medical Research Council. They do have difficulties in deciding where a particular proposal or area should lie. We would not expect those to disappear, whatever kind of division one makes.

I think the only summary answer that I can give to your question is that it seems to us that we can accomplish the objectives in covering the spectrum of research within the three councils with no more difficulty . . .

The Chairman: No more confusion, than now.

Dr. Macdonald: No more confusion, than would be the result of the changing of the structure in the way you suggest, or in any other way.

The Chairman: I would like to ask a few questions before we adjourn. Have you considered whether or not it was desirable to have government institutions which would carry on research, carry on non-mission oriented research more or less parallel to the work which is being done in universities?

Dr. Macdonald: For example, an institute of economic research?

The Chairman: Or in the social sciences or in some of the activities which are carried on now by the National Research Council doing a lot of work in basic and applied research.

Dr. Macdonald: We did not deal with it in a direct way. I think our response to that would grow out of the philosophy which is evident in the report, that is, that the basic research being undertaken for its own sake, should be supported in the universities.

The Chairman: But?

Dr. Macdonald: But there is what we have called oriented basic research; that does need to be done in relation to the missions of government and should be carried on by government. It would be our feeling that it would be unwise to establish institutes for research of a basic nature which were not related to any particular goal within the framework of government itself; that this kind of work should be within the universities.

The Chairman: But you have not considered the problem in any systematic way?

Dr. Macdonald: No, we have not.

The Chairman: Thank you very much: We will adjourn until 2.30.

Upon resuming at 2.30 p.m.

The Chairman: There may be a vote in one of the Senate committees in about half an hour's time which will compel Senator Carter to leave us, so I will ask him if he has any questions.

Senator Carter: Thank you, Mr. Chairman. I am very sorry for being absent this morning, but I could not be in two places at once. Because I do not know what went on this morning the questions I ask may have already been answered, and if that is the case I hope you will stop me.

If I read this report correctly, it recommends that councils will take over the responsibility for science for its own sake, and agencies will be primarily responsible for what we call mission-oriented research. The report recommends also that we keep the three councils we have now, and add two or three more.

The Chairman: You did not read the report that I read.

Senator Carter: Perhaps I misread it. I did not make notes as I went along. What do you understand it to recommend, Mr. Chairman?

The Chairman: There is a proposal to set up three councils . . .

Senator Carter: Yes, to retain the three we have, and to add some more. Is not that it?

The Chairman: No. Perhaps you want to comment on this, Dr. Macdonald?

Dr. Macdonald: Briefly, senator, we recommend the modification of the jurisdiction of the three existing councils. We recommend that the Medical Research Council be reconstituted, and separation of the granting function to universities from the in-house laboratory function of the National Research Council—that is, a separation of those into two different agencies. We use the term “National Research Council” to apply to the agency which would be responsible for the support of universities. In the case of the Canada Council we would separate off the granting function—that is, support for the humanities and social sciences—into a council for that purpose. We would separate that from the patronage of the arts. But, there are no new councils recommended.

Senator Carter: Then, I was a little mixed up. Did you not recommend that there be environmental research?

Dr. Macdonald: No, sir.

Senator Carter: Who would do environmental research under your recommendations? How would that be done?

Dr. Macdonald: There is a very large number of departments of government that are involved in various aspects of environmental research, but we would look upon that as being mission-oriented research which could be organized in terms of a government function which is to be performed, with research being one of the supporting elements of that function, whatever it is. And the Government, of course, from time to time changes its organizational structures and the boundaries of the various departments that it has.

Senator Carter: You have various agencies for research in water pollution, air pollution, and all the rest of it. Who is going to co-ordinate this type of research?

Dr. Macdonald: We made no recommendation about that. Our terms of reference limited us to the role of the federal Government in support of research in the universities, so we did not make any recommendation about how that should be done.

Senator Carter: The idea I have been getting as I have been listening to the evidence before this committee is that in the overall picture we should be concentrating upon what we can do best, and what

is most natural for us to do, such as Arctic research, marine research, communications research, and medical research. I know that you are dealing specifically with universities, and it seems to me that we should, first of all, establish centres of excellence so that we have certain universities specializing in certain types of research. Is that one of the things you have in mind?

Dr. Macdonald: That arrangement becomes possible if one accepts the proposals in our report for an extension of the numbers and kinds of grants, and support available, particularly in respect to the recommendation for a negotiated development grant along the lines that the National Research Council has pioneered, but extending it to the other councils, and with the Government having the option of investing larger amounts of money in grants of this kind if it so chose to develop centres of excellence.

Senator Carter: You touch on that in your report, but I got the impression—I must say that I did not have the time to study this as thoroughly as I would like—that you would concentrate on universities that were the best equipped physically, but these would not necessarily have the best men to make use of the equipment.

Dr. Macdonald: No, senator, our proposal in respect to negotiated development grants calls for the support, through this form of grant, of programs which have already demonstrated a degree of excellence, but which perhaps need additional support to establish what is commonly now called “critical mass” in order to become important nationally and internationally. The basic criterion which we call for is excellence already in existence.

Dr. Dupré: In addition to negotiated development grants we have proposed that the councils be in a position, as Government funds permit, to offer something that we have called the strategic development grant. Here, the idea is to fund research in universities where there is perhaps not very much activity in a certain field of research already, or where there is need to catch up, so to speak, to existing standards of excellence elsewhere. In brief, then, what we have is a range of tools which we propose the federal Government could use—negotiated development grants to build on strength and excellence where it already exists, and strategic development grants to make possible the emergence of a degree of excellence where none exists at present.

Senator Carter: When you come to select the centres of excellence do you find that there is already a consensus on what they are and where they are located?

Dr. Macdonald: I think in the case of centres of excellence there is generally a consensus. These places do stand out, but this is not to say that we are not calling for rigorous adjudication in a judgment by the councils or other agencies as to whether or not they want to provide negotiated development grants.

We feel that wherever the Government is providing funding it should be on a basis of adjudication, which looks at the merit of the proposal, the quality that exists at the present time in the organization, the need to establish a regional balance in Canada, and also the need to respect differences between English-speaking and French-speaking universities, to acknowledge such differences, and to correct inequities if they exist. All of these things should be taken into consideration in making the judgments, particularly in respect to strategic development grants, but certainly they are important also in developing centres of excellence in the country.

Senator Carter: Are there gaps now in the fields in which Canada should be developing excellence?

Dr. Macdonald: This is not something on which we pass judgment in our report, but I would think it would be the view of all members of the study group that there are important gaps. For example, there is the problem of Arctic research, and the funding in this area. Your chairman, during the lunch break, drew attention to the fact that we spend very much more in some areas than others.

The Chairman: This was off the record, but you can quote me just the same.

Dr. Macdonald: This, I think, would raise questions about whether or not there is a sufficient emphasis on excellence in some areas. There are many examples, of course, of which Arctic research is one. We have done very little in the area of pollution, although we are starting to do some now. There has been a great deal of criticism of the lack of organized effort in the area of transportation research.

Senator Carter: I think you mentioned in your report that you received complaints that fields such as architecture were neglected altogether.

Dr. Macdonald: We think this is a serious problem. There have been judgments, which appear to be almost arbitrary, that certain areas would not be supported by the existing councils. Architecture is one field that complained it had difficulty, as did schools of business administration, and faculties of education in universities. Until recently the engineers had been claiming that they were getting inadequate support from the National Research Council, but our feeling is that that criticism has been corrected, and that

they recognize it has been corrected. There are many examples of areas which are, even now, receiving little support from the councils. Law is another one.

Of course, the result of all of these lacunae where support is not available is that those who are involved in these areas in the universities, see as a solution to the lack of support the establishment of new councils. We have had calls for a business administration council, an education council, a renewable resource council, and so on. A law council was one of them. As a matter of fact, I believe the deans of law have set up a committee of their own now to investigate the possibility of having a council on law research established at the federal level. If the existing councils had their terms broadened, and their mandates required them to cover all the disciplines in which research has been conducted in the universities, and to review applications from any discipline, the call for a multiplicity of new councils would disappear.

Senator Carter: Thank you.

Senator Bourget: I thought that my friend, Senator Carter, was touching on a point that appears in the minority report. I wonder if we could discuss it now, Mr. Chairman.

The Chairman: You may.

Senator Bourget: This concerns the basic philosophy which underlies your report, Dr. Macdonald. I suppose you have read the minority report. Dr. Dugal, unfortunately, cannot be here today. Are there some comments about what he said in his report?

Dr. Macdonald: I do not know whether there are any particular points.

Senator Bourget: I am thinking particularly about the opportunities that some university may not have when judged on merit or excellence. As you know, there are big and small universities, and I wonder if, in your recommendations, you have taken that fact into account so that the different universities will have approximately an equal chance of getting some help.

Dr. Macdonald: First of all, this bears on the question of adjudicating on the basis of merit, which is a view with which Dr. Dugal disagrees. Our position as a study group on this was that we do not see that it is an assistance to a university, or to the strengthening of research in Canadian universities, to give funds to support proposals which are not meritorious, either in terms of the implicit character of the proposal itself or the qualifications of the individual to carry the research out.

We feel that this does not mean you have to seek persons who already have a lot of experience, but the proposal which they want to put forward should be tied to the training which they have, and it also should be a proposal which on scientific grounds—if it is in the scientific area—has intrinsic merits of its own. The idea of distributing federal funds as general support of research, without reference to merit, seems to us to be an inefficient way of improving the quality of research in Canadian universities.

At the same time, and to balance this view, we proposed in particular the strategic development grant, which is a method for the Government to assist in the development of high quality research where it does not exist, and to look at regional disparities and disparities between English speaking and French speaking universities.

The Chairman: Why do you not call them "opportunity research grants"? The word "strategic" has a defence connotation that may not be understood in the Maritimes or in Quebec.

Dr. Macdonald: There is no objection. This kind of grant could be used at the Government's discretion as widely as it chose and, if Dr. Dugal is right that this does not provide the kind of thing that is needed to help the French speaking university to catch up . . .

Senator Bourget: I am sorry to interrupt. I am not speaking only for the French speaking university. As you can see, I am from Quebec. I am also looking to the other universities like Sherbrooke or Carleton.

Dr. Macdonald: This is the point I was making, that if we have not done it for the French speaking university, for the problem Dr. Dugal was speaking about, then we have not done it for the regional disparities that exist in Canada. We gave in our own minds and in our writing a good deal of attention to this issue. We think the mechanism which we have provided gives the Canadian Government a better way than they have ever had to resolve these disparities that are regional, or that are in some instances English speaking-French speaking. In some instances there are large complex universities with graduate schools, and there are small universities that are undergraduate and which have, therefore, particular problems in developing research programs. All these things we believe can be dealt with by the strategic development grant or the opportunity research grant.

Senator Bourget: Do you feel that these Recommendations 49 and 52 would help them—that is, the research grant, and the strategic development grant? Dr. Dugal seems to infer, if I understood him well, that some universities in the past had the financial

capacity to attain that degree of merit or excellence which seems to be your philosophy, and which I do not deny, while others were handicapped to that extent that they did not have the same opportunities. Probably that is the reason why he mentioned that in this report. I do not know as I did not see Dr. Dugal, but you may know.

Dr. Macdonald: We certainly agree that there are disparities and that these need to be corrected, but I think we would be unanimous—that is, unanimous with the exception of our dissenting member, Dr. Dugal—that this machinery can provide the basis for correcting those disparities.

The Chairman: It would be largely a political decision, after the Government has considered the proposal, I would imagine.

Dr. Macdonald: Yes.

Dr. Vogt: Yes, Mr. Chairman, this committee has heard before, in testimony, that there are two kinds of research—good and bad. I think there is evidence that from Quebec, in particular, in the sciences there has been very good research emerging, and I think it needs to be encouraged. I do not think that one needs to encourage bad research, even in an emerging province.

Senator Bourget: I agree.

Dr. Vogt: I want to point out that the committee is represented by eight people from Ontario and Quebec and one who is an outsider. In my own region in the west there are many ways in which we disagree with the University of Toronto. We disagree about the siting of telescopes—and as to where in the body of Canada the navel is located—but we do not disagree, I think, on questions that are raised in the report. I think our problems are very different in the west from what they are in Ontario. The recommendations that are made in the report for allowing universities to differ will do very well for a smaller province, or a different province like one in the west.

Senator Bourget: You are satisfied with that?

Dr. Vogt: Yes.

Dr. Sirluck: Simply as a matter of location, Mr. Chairman, I think it is Recommendation No. 17 on which we are pinning our faith in this, rather than the derivative recommendations that are cited. On page 127 we explicitly assigned to this device, the strategic development grant—and it may be that that is why the "navel" analogy has come forward—

The Chairman: Are you the author of it?

Dr. Sirluck: The object is to recognize the need, the desire, and the willingness to initiate a significant program where it does not exist. We think that there are some evidences in the past year of at least one, and perhaps two, of the councils having taken some initiative with parts of the country, including Quebec, where such a need and desire exist, and having made a more rapid development possible. We think it is at that level rather than at the level of the judgment of the individual researcher's project that the significant stimulus should come.

I think it is really very ineffective to judge the project of an individual who is already there on the grounds that his district needs special support. We should get the special support into that district by a massive program which commits the whole university and, with it, its provincial paymaster.

The Chairman: To go on with this, I would like to ask a question about this criterion of establishing merit or excellence. Although I agree, of course, that this should be the general criterion that should be used in so far as assistance to research in universities is concerned, I would like to hear the members of this panel comment on the way this criterion up to now has been applied in Canada.

Are you satisfied that this has been really the criterion which has been used? To what extent has it been used effectively to see to it that at the beginning, at the pre-audit stage, real excellence is encouraged?

Dr. Vogt: I have just one comment about that, Mr. Chairman. I think that the committee had some reservations about the recommendation in the past, at least in some of the councils, because we recommend that the review committees of the councils which look at the proposals have members appointed to them in such a way as not to perpetuate the membership of the committee—that is, that the committee does not choose its own members. We felt that in the past there has been perhaps some kind of an establishment in the various disciplines in Canada, and that this has tended to be reflected on some of the review committees. We would like to see that problem reduced.

I think that other than that we did not have many reservations in the study group about the operation of, say, the National Research Council review committees, which I think have operated very well in the past to locate proposals of merit wherever they originate.

The Chairman: But we have been told occasionally that at the beginning some of these committees give a chance to new people coming into the field of research. When they succeed in getting a grant in their

own first years of research, irrespective of their performance afterwards they are more or less assured that they will receive assistance. If this is the kind of application of the criterion of science merit or excellence I do not think it is very worthwhile.

Dr. Macdonald: I would have to agree with that. We have had argument with members of the National Research Council about this. It is only fair to say that they feel that we are misinterpreting their history and what they have been doing to some extent. But, for example, we quote on page 120 the fact that in 1968-69, of 3,816 applications in all fields, 3,570 were supported, and only 6.4% were rejected. That is a very low rejection rate.

There are certain justifications which N.R.C. points out. They do want to get the new workers started, but we feel that once the worker has started the kind of review process that looks at the grant on a year to year basis has left something to be desired.

We noted that the rejection rate in the Medical Research Council also was not very high. As a matter of fact, the Canada Council's rejection rate was the highest of the three councils, being 34% in 1968-69.

I think I am speaking for the study group when I say that we feel that a more careful review of the proposal regularly each time it comes up, whether it comes up once a year or every third or fourth year as we propose in the management practice, is necessary, and it should be a rigorous review. The rejection rates are indeed very low.

The Chairman: So you would suggest that they be rather generous when they apply this criterion to newcomers at the so-called pre-audit stage?

Dr. Macdonald: Yes.

The Chairman: But then these committees should be much more strict at the post-audit stage—

Dr. Macdonald: Yes.

The Chairman: —when they are in a position to appraise the quality of the work which has been done?

Dr. Macdonald: Yes, and there are new applications coming forward.

The more experience they have had with an investigator, the easier it is to make judgment. This is not to say that at the beginning stages we think they should give money without a review process, but they should tend to be more lenient and lean over more in favour of the young worker at the stage where he has no experience, and no record on which to base the judgment.

I might also add—and it is relevant—a criticism which we heard from members of the council: The review committees do have some difficulty because they know that in many instances graduate students are supported by these grants, and in many instances the level of support is virtually the amount which is required to support the graduate student. They do not like to reject these proposals, because that rejects the support for the graduate student. That criticism is not one which is made only by us, but by members of the council to us. There is the feeling that this does make it difficult for the council to be as rigorous in its judgment of what proposals it should support as it perhaps would wish to be.

We propose machinery in respect to support of graduate students which we think would overcome that.

Senator Bourget: I have had some questions I would ask of Dr. Dugal, but I do not think it would be fair to ask them of Dr. Macdonald.

The Chairman: In the event they do not feel like commenting, it is their right to refuse comment.

Dr. Macdonald: I am very happy, Mr. Chairman, to try to speak for Dr. Dugal as well as I can.

Senator Bourget: In his final review report on page 358 he says:

Only three organizations—the National Research Council, the Canada Council and the Medical Research Council—have granted a higher proportion of our research money to the French-speaking universities of Quebec (up to 13 per cent of the total), but this proportion is still much lower than it should be.

I wonder if during your studies you noticed that through the government agencies there was too little money granted to, let us say, Quebec universities and if, at the same time, your two recommendations concerning the negotiated development grant and the strategic development grant will take care of that?

Dr. Macdonald: I think it is certainly true that there is a disparity of this kind. I know that the National Research Council, through its president, has been concerned about this.

As a matter of fact our idea for strategic development grants really originated with correspondence which we had with Dr. Schneider of the National Research Council. He was trying to find some ways of strengthening and assisting the French-speaking universities in Quebec to catch up. So this I believe is consistent with his own view of a way in which assistance towards catching up can be provided.

Certainly the view of the study group is that this machinery, if it is used wisely and vigorously by the federal government, can provide the answer. If it is used in such a way that very little money is devoted to this purpose, it is not going to do anything. I really is a matter of government decision as to how vigorously it wants to pursue this goal.

Senator Grosart: Mr. Chairman, we are still on chapter 5 and we have not got down to the sixty-four thousand dollar question.

The Chairman: I am watching you.

Senator Grosart: There is the recommendation that Canada Council support of research in the humanities and social sciences be terminated. I am very interested in that recommendation and I...

The Chairman: This is only the thirty-two dollar question.

Senator Grosart: I expected to find several pages of argument in support of that recommendation, instead of which I came across something that seemed to my simplified mind to be almost a *non sequitur*. There is only one paragraph leading up to that recommendation, and I would appreciate an explanation of the causal relationship between this argument and the recommendation:

For one thing, it is extremely difficult to place a number of important disciplines, linguistics and history, for example, in the category of humanities or in the category of social sciences. Then, too, as in the use of quantitative attribution techniques in literary criticism, there is a growing tendency in the humanities to borrow social science methodology. Conversely, much important work in social science, such as in the history of political thought, continues to be humanistically-oriented. Accordingly, we recommend that...

Perhaps somebody can explain the causal effect of this reasoning, and this very far-ranging recommendation.

Dr. Dupré: To take the first crack at that, senator, I believe that the particular reasoning which you quoted there is what leads us to recommend that there be a single council to cover both the humanities and the social sciences. Of course, we did look at the alternative, which was one of a number available, of having distinct councils—for example, one for the humanities, and another one for the social sciences. It was precisely the sort of phenomena to which you alluded in the quotation you read from the report which led us to the conclusion that there should be a single council to cover the humanities and the social sciences. Our point, therefore, is that

terminating the mandate of the Canada Council to support work in the humanities and the social sciences, should not lead to two distinct councils, one for the humanities and one for the social sciences. Our recommendation was rather that the humanities and the social sciences be covered by a single council.

The Chairman: But what was the reason why you wanted to separate the social sciences and the humanities from the arts? What is your criticism of the method of allocation of money of the Canada Council up to now which led you to that conclusion or recommendation?

Dr. Dupré: Again, I am willing to try to give some of the reasoning behind our recommendation. For one point I will go back to something that was raised this morning by Senator Grosart concerning the whole question of political control. It is true that what has been happening in the Canada Council in recent years is that it has become the subject of increasingly large annual appropriations as opposed to financing itself exclusively from endowment, as was originally the case. Once you have a situation where you are on annual appropriations you have to start, I suppose, to question whether you should have large annual appropriations going to a body that is not a government agency. This, of course...

Senator Grosart: Excuse me; why do we keep hearing the statement that the Canada Council is not a Government agency?

The Chairman: It is not. That is specifically stated in the act.

Senator Grosart: It may not be an agency under the definition in the Financial Administration Act, but...

The Chairman: It is a unique organization. I remember that very well because I drafted the bill.

Senator Grosart: It is all very well to say that it is in the act, but so long as it is getting annual appropriations it is an agency, because it has to report through the minister, and it has to justify its expenditures.

The Chairman: But it did not have to.

Senator Grosart: It has developed along that line. If the Rockefellers or the Fords had come along to add to its capital fund that would have put it in the very unhappy position of operating as a granting agency completely divorced from control of public judgment, and so on. I am glad that this did not happen. I am glad it had to come back. I am glad that the National Arts Centre is in the same position and has to come

back and justify what it is doing. I like to see this happen. I like to see a relationship between the public will and public action. I like to see that relationship as close as it possibly can be. I am not saying that there should be no funding unless you are sure you have got a one hundred per cent agreement from the public, but I like to see a relationship, and I like to see that interplay.

The Chairman: In any case, we were just discussing the legal position, and the legal position is that the Canada Council at the moment is not an agency of the Crown, and that is stated in the act.

Senator Grosart: We are being semantic because the Financial Administration Act labels them without any great...

The Chairman: It has other kinds of implications. For instance, the Canada Council can refuse to come before any parliamentary committee except the Public Accounts Committee. Again, that is stated in the act.

Senator Bourget: It is like the science adviser to the President of the United States, then.

Senator Grosart: I will not argue the point. But, in respect of the public funds it gets through the Estimates it has to report, and whether you call it an agency in the layman's sense, or in the sense of the Financial Administration Act...

The Chairman: This is beside the point we are discussing.

Senator Grosart: I do not think so, because we are discussing the Canada Council as it is, not as it is supposed to be. The report refers to the Canada Council as it has evolved, and I can understand why in the academic community there is some confusion. This is something that has evolved and...

The Chairman: I think the recommendation here is that the Canada Council should lose this kind of privileged position.

Senator Grosart: That it should lose its mandate.

The Chairman: It should lose this privilege of not being an agency of the Crown. That is the recommendation.

Senator Grosart: All the others, according to the recommendation, are to be special kinds of agencies of the Crown. It is these kinds of inconsistency in this report that bother me.

Senator Cameron: Is it not true that circumstances have changed very much. The Canada Council Act was passed with the idea that the Canada Council was to

be funded through specific grants, and that it was not answerable to the Treasury Board. The demands upon it have grown so much that the Canada Council either had to get federal grants or fold up. The result has been that the federal Government for the last five years has been making very substantial grants, and the Canada Council is now in the anomalous position of operating on a basis entirely different from that which was contemplated. There is another implication here, I think, and that is if we recognize the fact that the challenge to Canada and to science policy is going to be the funding, on literally a colossal scale, of research in the social sciences, then there is probably good justification for separating this aspect of it from the Canada Council. This is what I am trying to get at. This is the rationale of the committee.

The Chairman: That was the purport of my original question.

Senator Grosart: I am sorry; I did interrupt while you were giving the explanation.

Dr. Dupré: Basically, it was simply that one of the thoughts we had in mind was that there might be a need to regularize the legal status of support for the humanities and social sciences in keeping with a system that rests very heavily on annual appropriations. Thus, we could see merit in the idea of a humanities and social science research council, which would have the legal status of an agency corporation of the Government of Canada.

The Chairman: If the Canada Council lost its present special status and became an agency of the Crown, like the other councils, would you still recommend a separation between the two functions?

Dr. Dupré: There is quite a bit to be said for this. Of course, our mandate did not direct us specifically to look into the support of the arts. Actually, from the way our recommendation has been framed it is entirely possible to create a humanities and social sciences research council, which is then and there an agency corporation of the Government of Canada, and to have the Canada Council, as it now exists, continue as a patron of the arts. There is an interesting question in my mind here in that it is entirely possible that the endowment that the Canada Council has might well be sufficient to come very close to covering a sort of a support that it is now given, and can be given, to the support of the arts.

The Chairman: Do you feel that over the years the Canada Council has not done a good job in so far as the social sciences and humanities are concerned? Is this why you want to separate the two?

Dr. Dupré: Well, our work on the development of Canada Council policy certainly indicated that here is

an agency that has had a very sympathetic concern for the humanities and social sciences, as is indicated by the growth in the support that the Canada Council has generated. We were also conscious, as we did our work, that as the humanities and the social sciences became an ever increasingly larger part of the total operation certain kinds of anomalies seem to be developing which, in our judgment, certainly warranted a good, hard look at a far-reaching organizational change. To be specific on this, there has been, for some time, the whole question of the extent to which the humanities and the social sciences, and the universities themselves, are represented on the council body. Of course, this is the kind of concern that one finds registered in studies such as that done by Professor Mabel Timlin for the Social Science Research Council of Canada. She points out, at the time at which she was writing, that the Canada Council had very little representation from the humanities. She noted there was none whatsoever from the social sciences.

The Chairman: If you exclude law.

Dr. Dupré: Yes, if you exclude law. I think it is worth bearing in mind here, of course, the fact that the Canada Council did evolve originally from the idea of very general patronage, including, of course, a substantial amount of patronage in the arts. In that light, it is undoubtedly extremely reasonable to have a council that is very heavily made up of persons who represent local community interests, and who are bound up in the arts. Once the support of humanities and social sciences becomes a very large part of the operation then the whole composition of the council has to be looked at in a different light. To be sure, this is something you could remedy without necessarily splitting the organization up, but, of course, you come back to this whole question of annual appropriations.

I would point out also that there are some other questions that arose in our minds in the course of our research. We go to some length in chapter 8 of this report to describe the kinds of management practices that are followed by the Canada Council in administering its research funds. Certainly, speaking for myself, I would say that I detected here traces of management practices that I would say are quite probably rather more appropriate to the patronage of individual artists than they are to the support of researchers.

Senator Grosart: Excuse me. You use the word "patronage" when you are speaking of federal support of the arts, but other terminology when you are speaking of the universities. Is there any great difference?

The Chairman: It is not political patronage.

Senator Grosart: Is there any great difference between patronage of the arts and patronage of the universities? Is there a necessity for a different word?

Dr. Dupré: I think that is probably more a peculiarity in the way I am expressing myself.

Senator Grosart: It is fundamental to your thinking, I am afraid.

Dr. Sirluck: Perhaps we are only to answer questions. Is it permissible to ask one?

The Chairman: I do not promise an answer.

Dr. Sirluck: I will put my intervention as a statement, rather than as a question. The report states that the fundamental ground it has for suggesting the termination of the mandate of the Canada Council in the support of research is that there is no real similarity of function between the patronage of the arts and the support of research in these fields, nor is there even any very close substantive relation between the sectors. I, for one, can see no real relation between econometrics and a symphony, and I daresay there are many physicists who are better critics of music than an economist is likely to be. It seems to me there is a real difference between the notion of patronage, and the notion of the sponsorship of research for specific goals. I think it is easy to understand how originally in Canada these two tiny efforts could be put together, because there were some commonalities between them. Perhaps both had to do with the humanities, and the Government formed some sort of link because they were too small to be handled separately. Now that research in the social sciences is growing even more rapidly than with the growth of research in the natural sciences, and in the humanities is also achieving maturity in Canada—and the cost for support for research in humanities is going to grow very rapidly as well—we have to ask whether this linkage between the two functions has anything except a historical reality. The feeling of this committee is that there is no important linkage in what is needed to constitute an expert body . . .

Senator Cameron: When you say "this committee" you mean . . .

Dr. Sirluck: I beg your pardon; "study group". I meant the committee that is being questioned; not the one that is questioning.

The Chairman: You are a group.

Dr. Sirluck: That is right. The group view was that it requires, for the support of research in the humanities and social science, a council which is pre-

dominantly expert in that function (it should also have some public interest representatives); and it assumed that what is required in the sector of the support of the arts also requires some expertise.

If it were necessary to buttress that kind of judgment by looking into the details of administration or the details of policy, I daresay it would be possible to bring forward evidences that the Canada Council, in attempting to dispose of both its now very large functions, is using interchangeable methods more appropriate for the one field than for the other. We could, I think, if we had to draw up a list of faults, find material; but I do not really feel that the report would have been a more beneficial one if it had attempted to find fault in that sense.

If the criticism is that we do not put down a bill of particulars out of which an indictment flows, I think we would have to plead guilty to that criticism, because it was not our function to list things that could have been better done but to point to ways of doing things better in the future. We thought the real nature of the Canada Council is best understood historically and that a phase has really come towards its completion.

The Chairman: That makes me a Father of Confederation.

Senator Grosart: At the same time, a bit of a stepchild. Might I comment that this seems to be an exercise in academic pigeonholing. I would like to see the same criteria of adjudication apply to the grant to a ballet dancer in respect to public funds. I use the term "public funds" in the largest sense; in fact all the funds of the Canada Council are public funds in one way or another. Should not the same kind of criteria of adjudication be applied here as would be applied under your system to the funding of someone to write about or do some research on conflict of laws? What is the difference? Why is conflict of laws in the humanities, and the development of ballet in the field of drama?

Dr. Sirluck: Why not microcellular biology?

Senator Grosart: Why are these in different categories? Tell me why you say the Canada Council must now or in the future concern itself only with grants in the field of culture in the narrow sense?

Dr. Sirluck: Sir, it is because, in the field of university research and in these two great sectors of academic work, we want a council which is oriented to that end. We certainly did not want to impose a handicap on the performing arts. Let me take one or two examples. In the other councils that are attempting to assess and support research in universities, the normal method of refereeing applications

is to draw upon the judgment of standing committees of the discipline, which get all the applications of the whole country and, therefore, the same group of people is able to establish a continuum within which they can rate the applicant.

Senator Grosart: Would you mind my interrupting there, to say that my impression is—knowing something of the Canada Council adjudication—that this is precisely what they do. They have groups from the arts—a music referee group, a graphic arts referee group—and I understand they do exactly the same as you are suggesting should be done elsewhere. I do not think it is fair to the Canada Council to say that they do not operate in a continuum of standard criteria of adjudication. I do not think it is fair to them to say they do not do that.

The Chairman: I think Senator Grosart is quite right, according to the evidence we have had before us.

Dr. Sirluck: The impression I had was that there were individual referees for each project and that subsequently the report of those referees came before the academic panel, which is a single panel covering the entire field of operation.

Senator Grosart: Excuse me, but I know for a fact that in the music field there is a panel, the chairman of which happens to be Louis Appelbaum. They are down here three or four times a year. They are called the grants committee. They referee them in exactly the same way, as is being suggested here.

Senator Cameron: May I interrupt? As one of the referees for the Canada Council on a number of occasions, I know this procedure is followed. But I do not want to get into that.

Looking at this recommendation, which has far-reaching implications, and looking at it from a management approach, my feeling is that this is a good recommendation, having in mind particularly the size of the appropriations that will have to be made if we are to have any impact in the social sciences.

What I am concerned about is that no mention is made here of the role you see for the Canada Council in the future. Does it go back to what it was originally, to subsist on the revenues from the capital grant—which was \$50 million, and a pretty good investment which was paying about \$5 or \$6 million; probably more than that today—or are you seeing it as a combination of living on the proceeds of the capital grant each year plus governmental appropriations every year?

The Chairman: They have not studied this and I think it was outside of their scope. They did not look at the arts.

Senator Cameron: The principle is important here. Here is a very important agency which has done a good job within limitations but it is facing a new era of development. We must keep the Canada Council going but in making this recommendation there should be some suggestion as to what the role of the continuing Canada Council would be. Is it going to be a fourth council? You have got three. Was it your thinking that it be somehow tagged along as a fourth agency? No one has said that.

Senator Grosart: You have now got five or six. This would mean seven or eight.

Senator Cameron: But this is not here. Historically, as the chairman says, this is very important.

Senator Grosart: I think it might be mentioned here that Senator Cameron heads the Banff School of Fine Arts, which is a university,—a very good one, and one that is very necessary one in Canada. Why do you take the fine arts out of this whole research grant to universities picture? I do not understand it. There is a lot of research in the arts going on in universities, research in painting and in music, research in the whole spectrum of the graphic arts.

The Chairman: I think we should let our guests answer a little bit more than they have been doing in the last 15 or 20 minutes.

Dr. Sirluck: On page 107 the report says:

Always consistent with our view that the three federal councils should encompass all legitimate areas of research, we would envisage the new Council as supporting research in the history of art, the history of music and related fields. The Canada Council, for its part, would be solely responsible for the fine and performing arts as such, and would not form a part of the research council structure.

What I think the study group would answer to the question that has just been put is that so far as the arts are a field for research in the universities they should be supported, as any other humanistic discipline, by the Humanities and Social Sciences Council that we propose according to the methods of supporting research.

So far as the arts are an activity they should be supported by the Canada Council, continuing with the function it now has for the support of the arts. We are attempting to separate the research function from the patronage of the arts themselves.

I think that our silence on the nature of the structure that is the patron of the arts is mere humility; we did not want to make gratuitous recommendations that we had not been charged to make. This is not because we think it is unimportant. I for one think that it is of immense importance, but I think that the capacity of the Canada Council to respond to the performing arts in the future, when research is so much bigger than it is now, will be diminished if it retains responsibility for both functions.

The Chairman: I think that we will have to leave this, because I am sure we have other questions to discuss. I would like to ask, as far as I am concerned at least, a last question:

To what extent do you think that this recommendation for separation of these two main activities of the Canada Council is being supported by the university community in this field?

Dr. Macdonald: I do not think, Mr. Chairman, I could answer that yet. Certainly we did hear proposals as we crossed the country during our sessions when we were conducting the studies that there should be a separation.

We heard proposals for a greater separation. As a matter of fact, in some circles there were suggestions that there should be a separate council for the humanities and one for the social sciences. There certainly is support for the proposals that we put forward, but whether it represents a consensus I simply could not say yet.

Dr. Dupré: I have, of course noticed—I may say with some concern—the extent to which perhaps at least in the press the organizational changes that we have recommended have tended to eclipse other recommendations that have been made in the report.

Speaking personally on this point, Mr. Chairman, I am reminded here a little bit of that great Pope couplet:

For forms of government let fools contest;
Whate'er is best administer'd is best:

Translating that at the administrative level I suppose one may say for forms of administrative organization let fools contest; whatever policies are implemented are best.

My point I think really in the last analysis is the following: Government organization is almost inevitably I think, as Senator Grosart perhaps very rightly pointed out, an exercise in academic pigeon-holing, no matter what you are dealing with.

I think, for example, of immigration, which has been successively in the Department of Mines and Technical Surveys, the Department of Citizenship,

the Department of Manpower and heaven knows what will be the last optimal judgment as to where this particular function should be pigeon-holed in government.

I think it is very much like this in terms of any government function that you are going to look at. Just how are you going to structure it? Where are you going to lodge it?

Speaking personally I would say this, that we have made a number of substantive recommendations in this report dealing with financing of research, the kind of tools that the federal government should use to support research, project grants, strategic development grants and so on, with the financing of research including indirect costs, and with a host of different kinds of administrative practices.

As far as my personal judgment is concerned I think that if these substantive policies could be brought about, regardless of the form of organization, we would have what I would think as a member of this group would be a very substantially improved system of supporting research in the universities. Certainly the actual organization form of pigeon-holing that takes place does not necessarily guarantee that these are the kinds of substantive policies that are going to come about at all.

I would say this, that in the opinion of the group it is probably fair to say that the kind of substantive policies that would make for the optimum support of research in Canadian universities would be more likely to come about under the organizational form that we recommended than perhaps under the existing form. In terms of personal priorities I would put the substantive policies that we have been talking about well ahead of a particular kind of organizational form.

The Chairman: I want to tell you that today in our questioning as a committee here we have not been impressed by the press coverage of your report—and I do not say this in terms of any kind of criticism of the press coverage. I want to tell you that we are primarily interested in at least one main subject of interest, the re-organization of the mechanisms for formulating and implementing our science policy. That is why we have been insisting on these recommendations today, as far as the federal government are paying for indirect costs of research in universities, and all this.

I think that there you have interesting suggestions which are after all not too new, because they were in the Bladen report which appeared some years ago, and have not yet been implemented.

Today, at least, I am not intending to question you indefinitely or in detail about these other aspects, or what you call the more substantive aspects

of your report. I think that for us a committee at the moment the recommendations you make as to re-organizing the mechanism for formulating and implementing policies are for us of great importance. That is why we have questioned you on this kind of separation of the Canada Council that you are suggesting, because if this recommendation is acted upon it will have all kinds of implications after that. Whether you like it or not it will be substantive.

This is the reason why we are following that kind of questioning today as far as we are concerned.

Senator Cameron: How many faculties of fine arts in Canada have made a recommendation along the lines of your recommendation?

Dr. Macdonald: Faculties of fine arts?

Senator Cameron: Yes, there is a number of faculties of fine arts in the Canadian universities. I am not sure just how many there are. I can understand it when you say there has been criticism of the Canada Council, but in arriving at this recommendation did you get representations from faculties of fine arts which would lead you to this conclusion?

Dr. Macdonald: If my memory serves me correctly, Senator Cameron, I think we had only one brief which came specifically from fine arts groups, and this was from a group of three universities in British Columbia—from a group of fine arts people at U.B.C., Simon Fraser, and Victoria.

The Chairman: The Banff School was not represented?

Dr. Macdonald: No, we did not receive a brief from the Banff School.

Dr. Vogt: Mr. Chairman, I just want to add a comment to the suggestions that we heard on our visits across Canada. As outsiders listening to people in the humanities and social sciences across Canada I think it is fair to say that we found that they had been long short of funds, and also that they were not very articulate about what they wanted to do. Generally, we found they were enormously grateful for what the Canada Council had done in recent years, and because they had this new-found wealth they were not very interested in making suggestions for change. I think some of the reasons for change were to make the arrangement parallel what we have in the National Research Council, which we are also uncoupling from an agency which runs laboratories.

The Chairman: I hope we will come to that very shortly.

Senator Haig: Mr. Chairman, you have allowed Senator Bourget to jump around the place, so I will turn to page 166 . . .

The Chairman: I should learn never to make exceptions.

Senator Haig: That is your privilege, Mr. Chairman, but with leave I will ask my question.

The Chairman: Very well.

Senator Haig: You mention here that the funding is given by a grant or a contract. In the second paragraph on page 167 you say:

A point of enormous significance, in our view, is that neither the grant nor the contract is an instrument developed specifically to support research.

I ask the chairman of the study group what he would suggest in its place.

Dr. Macdonald: We suggest in its place a research agreement. Perhaps Dr. Dupré would like to speak to this.

Dr. Dupré: We have suggested in place of the grant and the contract a new legal instrument that would be drawn up specifically to support research in universities.

Senator Haig: With an open-ended clause in it to the effect that if the research project is for a period of two or three years and it is discovered after a year and a half that another grant is needed, or another year is needed—would it be in an open-ended agreement?

Dr. Dupré: No, it would not. The research agreement could be drawn in such a way that the project would have to be reviewed, say, from a fiscal point of view annually, and, if it was a long range thing, the grant would be subject to termination on a year's notice. A research agreement could accommodate any of these possibilities, and, in a sense, a research agreement is a form of contract, if you will. By designating such an instrument separately we felt, first of all, that the Government would have a better means than it has at present of gauging just what kinds of agreements are being entered into with universities as opposed to all other kinds of contractual arrangements that sometimes take place with universities such as, for instance, the purchase of personal consulting services, and things of that sort. The same research agreement would highlight the kinds of broad standards of management practice that we hope the Government would consider to be appropriate to use in financing university research.

Senator Haig: Well, you put the grant and the contract together, and get a research agreement?

Dr. Dupré: In a sense, and I might point out also that our idea of a research agreement is not new. We spent some time studying the kinds of work that has gone on in the administration of research in Great Britain and the United States, and quite specifically the idea of a research agreement was first broached in detailed terms by a report that was issued by the Bureau of the Budget in the United States. That is a report by Dr. Lee Westrate, who went through very much the same kind of exercise that we went through in respect of chapter 8. It went into the different kinds of practices—and there is a multitude of them—that now obtain in the existing system where grants and contracts are use sometimes almost indiscriminately and interchangeably for the support of university research in that country. The particular recommendation of this report of the Bureau of the Budget was that thought be given to segregating under a separate kind of legal instrument with its own name those particular kinds of transactions that occur between the federal Government in that country and the universities for the support of research.

Senator Haig: The universities will make an application for a research project, either basic or applied?

Dr. Dupré: Yes, sir.

Senator Haig: And if it is accepted when an agreement will be entered into between the federal Government, or its agency, and the university outlining the term of the research, the estimated cost, the capital or income, and so on. That would be drawn up?

Dr. Dupré: That is correct, sir.

Senator Haig: So you have really a combination of a grant and a contract?

Dr. Dupré: That is correct, sir, and, indeed, in a sense I think it is worth noting the way in which research procurement practice has evolved in this country. You have a situation where grants and contracts in many instances have started to look very much alike. This is not least because of the peculiar needs that universities have in terms of the kind of government procurement practice that is applied to them, and the idea of a research agreement is simply to try to sort out what is now a rather indiscriminate use of two legal instruments, and to group all procurement practices under one single form of legal instrument for the support of university research.

Senator Haig: What if a department of the federal Government requested a research project on, say, the colouring of the fish in Placentia Bay? That would be a specific research project initiated by the federal Government, or a department thereof, and given to a university?

Dr. Dupré: Yes.

Senator Haig: Then, would there be an agreement between the federal department and the university in respect of that project?

Dr. Dupré: We felt that for this kind of project the research agreement would also be an appropriate legal instrument. We saw very few exceptions to the use of a research agreement with the universities. We set these out, I believe, and they are limited to the purchase of personal consulting services, to classified research, and to the actual procurement of hardware.

We see no obstacle to the use of a research agreement where the government department has, in a sense, initiated the research project. We found in the course of our own investigations many instances of grants or contracts between the government agency and a university where which actually originated the proposal, the Government or the university is very often "a chicken and egg proposition". This is not least, of course, because university researchers so often interact with their professional counterparts in government.

The Chairman: It is already 4 o'clock. I would like to have some time to discuss NRC as well, therefore, I think that we should limit, for the time being, at least, questions which are not related to NRC. If you wish to ask another question, Senator Carter, in the same vein, I will allow it.

Senator Carter: I was not following that. I suppose probably it is related to it.

The Chairman: Ask your question then.

Senator Carter: You have Government agencies carrying on work in their own labs. I get the impression, from your report, that you feel there should be more integration, better relationship between the Government labs and the university labs, and that even the Government should have their labs on the sites of universities. Am I correct in that?

Dr. Dupré: This is now the case in a number of instances.

Senator Carter: You recommend more of that?

Dr. Dupré: Absolutely. We recommend that the federal Government undertake a far-reaching study of its intramural laboratories with a number of criteria in mind. Just one of these criteria, which was included in the list, was the extent to which the siting of intramural labs in relation to universities might be beneficial, both to the labs and to the universities.

Senator Kinnear: I think you said in your report it was not very successful, because they got acquainted for a day or two and then forgot each other.

Dr. Macdonald: That is variable, senator. In a number of instances it has worked very well. In many instances it left a great deal to be desired, and the mere placing of the Government laboratory next door to some laboratories on a university campus is no insurance that there will be a good interaction. It seems to depend, more than anything else, on the personalities of the directors on both sides.

Dr. Dupré: It can also depend upon a number of technical and mechanical factors as well, such as the extent to which the personnel policies of both the federal Government and of the universities make it possible for intramural laboratory scientists, to teach part time on campus or vice versa.

The Chairman: I think we should come now to NRC and, fortunately on this occasion, I was not the father of that great institution which was established in 1916. I understand that you suggest that either, directly or indirectly, NRC, as it exists at the moment, should be eliminated—directly because they would cease to give grants to universities, and indirectly because the Government should reconsider the status of all its research labs. That would include, I am sure, the NRC labs. I am sure that you have given a lot of thought to this and I would very much like to have what went through your minds when you came to that direct and implicit recommendation.

Dr. Macdonald: Mr. Chairman, I think I could start by saying that we do not view this recommendation as, in any sense, being an elimination of the National Research Council. For example, it was not considered to be an elimination of the National Research Council when the Defence Research Board and Atomic Energy were hived off, and when the Medical Research Council was established and took with it one of the functions of the National Research Council.

We are keenly aware of a long and distinguished history of the NRC and the very important way it has contributed to the growth of science in Canada, without which, over the past 40 years or so, this country would have been in a very bad way scientifically. We are impressed at the same time with the fact that it has been an evolutionary process in which the National Research Council has undertaken certain functions, which have grown and become viable on their own as well as becoming functions which have been separated from the main body of the National Research Council and have operated autonomously. I have noted the Defence Research Board, Medical Research Council and the Atomic Energy.

For this reason, it is our feeling that there is no reason to anticipate that this evolutionary process may not continue and as John Gardner has said, renewal in institutions is an important function. From time to time institutions have to examine their own function and their own operation in terms of its relevance to the kind of society and kind of issues with which it has to deal. We see an increasing divergence in the function of the National Research Council as it is now structured; a divergence between the function of supporting university research, much of it basic in nature, and the desire of the council to have its laboratories revitalized and identified with clear tasks.

This difference in function is an important one, because the attitude of scientists who are involved in applied research or task oriented research, or whatever one might wish to call it, is likely, in many instances, to be different from the attitude of scientists, who are engaged in basic research without any application whatever in view. Both are needed. The size of the function of the support of university research is already equal to—indeed, it is slightly greater than—the function of the support of laboratories. The growth of the support of university research has been very much greater in recent years than that of the growth of support of the laboratories, and that growth is surely going to continue.

We are at a point now where we have, I think, about 16,000 full-time faculty members in our Canadian universities, 9,000 of whom are in the social science humanities sector and about 7,000 in the science, engineering and medicine sectors. With the growth of our universities from an enrolment in 1967-1968 of 270,000 to an estimated 540,000 by 1975 it is clear that there is going to be a very striking growth in the number of faculty members that are in the universities for educational purposes and to conduct research. We can, therefore, anticipate that there will continue to be a very much more rapid growth of the support function for university research than the growth in support for the laboratories themselves. Moreover, the function of the support of research is becoming even more complex. Certainly, if the proposals which we have incorporated in our report, as to program grants, negotiated development grants, strategic development grants, and other major proposals, are implemented, this will add a great deal to the complexity of the operation of the support of research. All of these reasons are adding administrative loads to the National Research Council, and require an organization that is devoting itself to the administration of very large sums of public money—sums which are getting rapidly larger and will continue to do so over several years.

All of this seem to us to be reason for feeling that the time has now been reached to separate both the functions of the National Research Council, and to have them each go their own way.

This is not to say that we would wish to see at all any loss of contact between NRC scientists and the academic community—quite the reserve. We would like to see that comradeship and association continue as it has in the past. We think it can continue on a basis which is even more healthy if these two organizations were each to go their own way.

Finally, in my own mind, at any rate, the most important point of all is this. We have tried to set forth in this report the view that the federal Government has two fundamental relationships with the university—one is to support university research *per se* for the purpose of having a strong university, and the other, of course, is to procure research of interest to the Government itself.

We have 41 agencies that are involved in the support of university research development and it is our feeling that those who are associating themselves with the problem of supporting university research *per se* should be developed to just that, and that should be their sole function. They must relate to each other; there must be a very close interlocking of the functions of the National Research Council, the humanities and social sciences research council and the health sciences council as they are proposed in this report.

We feel that if these agencies are, by mandate, devoted to the purpose of supporting university research *per se*, for the purpose of having strong universities in Canada, then that particular goal of the Government will be ensured.

We are not concerned that the other goals of Government, in terms of support of research of interest to Government, will in any way be depreciated by the fact that three agencies out of a total of 41 are devoting themselves to the universities.

These are at least some of the thoughts that we had in mind in coming forward with this proposal.

The Chairman: So, in your Recommendation No. 26 you were not really raising any kind of fundamental question as to the future of the laboratories which are at present administered by the NRC?

Dr. Macdonald: No. We certainly would expect to see those laboratories continued. We would expect also on the basis of messages we received in discussion with Dr. Schneider that the laboratories themselves are going to make vigorous efforts to try to develop a new focus for their own work. We have there a great strength for the country and a very important resource which can be used more effectively.

Dr. Vogt: I want to reinforce that, Mr. Chairman. I think Canada has done very few things as well in science as the National Research Council laboratory,

and it would be a tragedy for the country to destroy that, or to destroy anything that is doing the work so well. It is very far from our intention to damage the laboratory in any way.

Perhaps that aspect gave us the greatest deal of concern in the study we made and the recommendations we put forward regarding the splitting up and the providing of alternative councils.

In the long run, we felt it was not healthy for laboratories to have this very large university granting function associated with it. The laboratories' budget over the last few years has remained stationary while the university portion has gone up by a large amount. To some extent, laboratories have felt inhibited from approaching the Treasury Board for funds, while the universities have been asking for large new funds. I think they should not have those inhibitions. If the separation occurs at the top of the National Research Council, then we are more likely to have a strong maintenance of the National Research laboratories in Ottawa.

Senator Grosart: Mr. Chairman, it seems to me that the recommendations here are boiling down to this: that we should have one lump sum which is federal funding to be allocated for university support *per se*—I do not know what "*per se*" means in this case, whether it is for education or for basic research. I know there is a problem in making the distinction.

The Chairman: Basic research, and producing manpower.

Senator Grosart: The literature on the subject is full of this argument as to where one ends and the other begins. I am asking: Is it the suggestion that there be a lump sum that would be allocated for university research *per se*, which would be administered by these three main agencies; and then would there be another lump sum directed to the support of research in universities which would be, if you like, mission-oriented by departments and other agencies? Is this the basic suggestion?

Dr. Macdonald: The first part of your interpretation is consistent with our view—a lump sum for the three councils—but certainly not a lump sum for any of the agencies.

Senator Grosart: I mean, in the net result, there would be a lump sum if you add up the mission-oriented support from the departments and agencies?

Dr. Macdonald: Yes.

Senator Grosart: So you would have two lump sums. The lump sums would have all sorts of components,

but in the end result, in the public accounts you could break it and say that here is the total amount that now is going to universities for support *per se*—to use your phrase—and here is another lump sum that is going for mission-oriented support in the universities.

If this is so, could not there be another view, that rather than concentrate the *per se* money in the hands of one group, thinking only of university support—that the present arrangement continue under which the National Research Council says: “Here is money for national research. It is good and sensible for us to say that so much will go into funding universities by grants or contract, and so on, and so much will go into intra-mural in-house activity, and so much will go to industry”?

Dr. Macdonald: That is not what happens now. There are two separate votes of the National Research Council, one for the laboratories and one for the support program.

Senator Grosart: Yes, the estimate is prepared by the NRC. They break it down. This is the very point I am making. Is it not good sense to have some agency, as Senator Cameron pointed out, looking at the university problem, the agency problem, and the in-house problem? I do not see it in your terms of reference, but where do you fit in this highly compartmentalized type into the overall system? What happens to the rest? This seems to be the problem. Again I appreciate the fact that you are not required to say what happens to the laboratories, but in this committee we have to wonder about this. If I may quote from page 103:

We see them under independent leadership responding to government directives as a group of flexible task forces capable of adjusting their organization and re-grouping their manpower from time to time to tackle important scientific assignments.

Personally, I cannot think of anything worse that would happen than to have that independent leadership responding to government directives. What is the independent leadership? Where do the government directives come from? How are these flexible task forces a group? How are they capable of adjusting their organization and re-grouping their manpower, unless you have somebody at the top exercising the function of this direction?

This may not be a fair question—it has nothing to do with the universities—but I am asking you what happens. I cannot see anything worse than a bunch of flexible task forces re-grouping themselves at will; we have enough of this now. We have lack of coordination and overlapping, and it seems to me this will make this problem much worse than it is. To break down the National Research Council laboratories into a bunch of task forces frankly frightens me.

Dr. Macdonald: Is that not the way they have operated for a number of years?

Senator Grosart: “Task force” is a comparatively new term.

The Chairman: It may be that we are dealing with an old situation under a new term.

Senator Grosart: There is a difference between “task force” and a “mission-oriented project” or “program,” and I much prefer the mission-oriented direction to the task force. I would be interested to know if you do not see some danger in compartmentalizing this whole university funding and taking it out of the broader picture of national science policy.

Dr. Macdonald: No, I frankly do not see any danger, senator, in doing it; as a matter of fact, quite the reverse. I think it will ensure the kind of support for basic research in the universities which is important and which we do need to ensure.

Senator Grosart: But will it ensure a good national balance of R&D funding?

Dr. Macdonald: That will depend on the quality of the judgments made by the politicians as to how much they are going to put into this area. We talked about this briefly this morning and the possibility that, perhaps, from experience it may now be roughly 10 per cent of the total effort of the country for R&D. Whether that is the right percentage, or the best balance, is something that we would not be prepared to make a judgment on now, but I think the Science Council should be looking at issues of that kind and advising the government. The Government has to make the decision as to what constitutes balance, as to what is good balance.

Senator Grosart: This really becomes something much more than a science and technology judgment on the part of the Government, and this is what bothers me. This then becomes a separate judgment as to the funding of the educational capabilities of universities.

Dr. Macdonald: In terms of the training of manpower, that is part of it, yes.

Senator Grosart: That is one part of it. The whole scientific capability, whether you are in basic research or development, may be a capability for innovation or a capability to seize the opportunity of innovation. I do not see how you are going to get a government to separate these unless it is approached in much the same way as it is being approached now.

I agree that we need much more coordination and much better management but I am concerned about this compartmentalizing of the whole university funding. I think you are going to lose out; that is my worry.

Dr. Dupré: If I could say this, senator, I agree that there is a danger in compartmentalization, in the sense that you would not want to compartmentalize the kind of advice that will be given to our political leaders on the long-run merits of allocating resources as among let us say, business, industry and universities. This is very much in the nature of a scientific advisory process. But as we also know from experience in a number of countries, it has been deemed wise to separate the function of tendering scientific advice from operating agencies of a government. For example, we have the President's science advisory committee in the United States tendering advice on scientific policy, as opposed to the National Science Foundation. We have had in this country, of course, a change in the role of NRC. It was once very much of an advisory body, but this function has now been taken over by the Science Council of Canada.

I agree that there is a need for unity in the kind of advisory mechanisms that you have, so that when politicians make allocation decisions as among business, industry and universities, they make their decisions on the basis of advice that takes all of these sectors into account.

At this stage of the game, I think this is an excellent plea for a science advisory body that takes into account all objectives. It does not necessarily mean that your operating agencies, which are probably not appropriate in terms of rendering broad-gauged advice to government, should also be unified.

Senator Grosart: It is perhaps because I like the evolutionary process that I am impressed with the very thing that has happened in the National Research Council, where they have now split their money in half. They have roughly a hundred million dollars and they have evolved a pattern of funding of university research to its present level of forty-five million. I like this process better than that which somebody called the draconian approach.

Our problem, here as I see it in this committee, is to recommend some kind of mechanism which will put science into science policy and bring science action out of science policy.

I am becoming more and more convinced that the mechanism has to be a total and a global mechanism in the R&D picture. Other than that, I do not see how it is going to function. After all, the separation of funding into three main sectors—university, intra-

mural and industry—is an artificial one, a book-keeping one, and I see a tendency here to perpetuate this purely bookish approach to it, forgetting the importance of the global look at our whole research and development effort. That is my concern here.

Dr. Dupré: I fundamentally agree with your concern, in so far as the advisory function is concerned. However, I am not quite sure why you see a need for the same sort of global approach at the operational as opposed to the advisory level.

The Chairman: You may be right in suggesting more division, but the more you divide, it seems to me, the more you have to coordinate too.

Senator Grosart: Then you get back into this internal competition business which might develop out of some of these recommendations.

The Chairman: In this respect, I wonder if we could spend a few minutes dealing with your proposal as to this secret operation in the Treasury Board? I am intrigued by this.

Senator Blois: Before we leave this, Mr. Chairman, may I ask one question?

The Chairman: Certainly.

Senator Blois: If you do away with the powers and authority of the National Research Council what effect would that have on the provincial councils? I believe that most provinces have their own research foundations which work closely with the universities and also with the National Research Council. They are doing a splendid job so far as the provinces are concerned. My worry is as to what effect this might have on these local foundations.

Dr. Macdonald: That is, organizations like the Ontario Research Foundation?

Senator Blois: Yes. I happen to have been a governor of the Nova Scotia Research Foundation since it was formed in 1946. I know of what excellent work it is doing, and I know it works closely in Nova Scotia with the National Research Council.

Dr. Macdonald: Senator, I do not see how these proposals would influence that relationship.

Senator Blois: Do you think that those foundations will continue as they are now?

Dr. Macdonald: I do not see how these recommendations would influence their activities at all. Perhaps

some of the others have comments to make in this respect.

Dr. Vogt: I think that the change we are recommending here in the National Research Council is not very much more than that it be a different person who walks to the Treasury Board with a recommendation in respect of the university granting function and for the laboratories. The organization of the laboratories, I think, would need a very similar board to that which they have at present, consisting of people from outside the universities, and there might be some cross membership between the boards of the National Research Council and the university granting foundation. I think that the importance of the change has been exaggerated in the discussion.

Senator Grosart: I think if you had put it the other way around and said that the National Research Council would carry on with the laboratory responsibility, and that there will be a new council called the University Research Council, you would have less trouble.

The Chairman: Yes, and, of course, there is always the danger of misrepresenting your recommendation about government intramural laboratories, which seems to me to be putting a kind of uncertainty on the N.R.C. labs, especially when you take their name from them.

Senator Grosart: That is what I mean. It is a sacred cow.

Dr. Macdonald: I am a little disturbed to think that that kind of interpretation had occurred to you. This is certainly not intended at all.

The Chairman: I think I was a little bit mixed up also with another forthcoming report which will suggest that these labs be given to the universities.

Senator Grosart: I have been mixed up ever since you said at the start that this report did not recommend any great changes in the method of allocating funds.

Dr. Sirluck: Mr. Chairman, I can see how the language, which was rather hastily selected towards the end, can be misinterpreted, but this passage . . .

Senator Grosart: On what page is it?

Dr. Sirluck: Page 103, I am referring to the passage you read before. This was really an attempt to get down to the substance of what the president of the National Research Council gave us to understand was the direction in which the labs were being reorganized. We thought that that was an extremely good direction for the labs.

The Chairman: I do not remember his mentioning this here. The only thing he mentioned in relation to your recommendation, as I recall it, was that he would be very upset if the National Research Council were cut off from assistance to universities.

Dr. Sirluck: Yes, I am sure that is so, but he did speak to us, while we were attempting to clarify our own minds, about what he saw as the optimum development in the labs for the future, about large missions and a restructuring of the labs in order to maximize their capacity to deal with emergent problems. I think it is in that sense that we had something here about government directives, but we were not attempting to construct the machinery for what was not our responsibility.

I do concede, from listening to the questions today, that in terms of the names of the two councils we used opposite practices in the sense that we thought that the Canada Council and the patronage of the arts were so inseparably linked in the public mind that we would have to provide ourselves on the university side with a new name, but somehow the other impression came through and the National Research Council . . .

The Chairman: I am surprised at our lack of imagination when we come to naming these agencies. There are so many words in English that we should be able to get away from "council" occasionally.

Dr. Sirluck: Some other names have been used, but they would not bear formalizing.

The Chairman: Should we come back to this matter of the outgrowth of the Treasury Board?

Senator Cameron: I would like to hear about the secret part of it. Secrets are always intriguing.

The Chairman: There is nothing now parallel to this within the Treasury Board?

Dr. Macdonald: That is true, Mr. Chairman. We are aware of that. We are aware from our discussions that members of the Treasury Board feel it would be useful if some machinery could be available to them to provide them with advice which would assist them in making judgments about the allocation of these funds.

The Chairman: Within each council?

Dr. Macdonald: No. As a matter of fact, I certainly do not want to leave the impression that the proposal here has been suggested by the Treasury Board. The members of the Treasury Board presented us with their problem, and this is our attempt at solving that problem. We considered carefully the possibility of having a public agency—and at one time we used the

term "umbrella agency"—and that was discussed quite widely . . .

The Chairman: That is something that could very well be a kind of extension of your co-ordinating committee.

Dr. Macdonald: Yes, but we rejected that in favour of the kind of organization which is proposed here, and which would give confidential advice to the Treasury Board, and which would be the Treasury Board's instrument and not the universities' instrument. In other words, it is not there for the purpose of promoting the interests of the universities specifically, but to assist the Treasury Board in deciding how it should allocate these funds, particularly in the event that the Treasury Board specifies that it is simply not going to be able to provide the total sum for all three councils that is requested. How then shall it be allocated?

The Chairman: You will really have two groups of university people, those who will be on the boards of these three federal councils, operating more or less in the public eye, and then you will have the grey eminencies going through the Treasury Board and upgrading in secret. They will also be coming from universities. I suppose they will be the directors of the departments, as opposed to deans, on the boards of the councils.

Dr. Macdonald: We do not suggest, Mr. Chairman, that they should come from the universities. We say that they should be people knowledgeable in university matters.

Senator Bourget: Who will appoint them?

Dr. Macdonald: The Treasury Board will appoint them.

Senator Grosart: Would you let the Canada Council join?

The Chairman: They would not be there.

Senator Grosart: I am asking if they would be allowed to join.

The Chairman: You have studied the possibility of having this kind of umbrella under which the three councils would come, and you have rejected it?

Dr. Macdonald: Yes.

Senator Cameron: Supposing this Senate Science Policy Committee recommends that the responsibility for science be taken away from the Treasury Board and that we set up some other machinery, what would happen to your secret advisory committee then?

The Chairman: I suppose we would have to revert to the umbrella.

Dr. Macdonald: This occurred to us, of course. There may be changes in respect to the whole pattern of advice in the area of science. It may be that, under those circumstances, the need for this kind of structure might disappear, but there was one additional consideration which was in our minds, and which, I think, is worth noting. That is, we are dealing here, not with science, but with research in universities which is covering a number of areas and which will be receiving increasingly large sums of money, in the humanities and in the arts too. Since these are not part of the science picture, it may be that, in terms of looking at the balance of the universities, this instrumentation or something like it might still be required.

The Chairman: Again, the Treasury Board would really be the place of last resort to decide whether or not the humanities and the social sciences should get more money than the National Research Council, and so on.

Dr. Macdonald: Yes.

The Chairman: It is rather late in the day. Of course, there are many other questions. Perhaps I could make a suggestion before we adjourn today. As I told you this morning, we are planning to have our own week next week, and to have next Thursday afternoon a kind of plenary session with representatives from all the universities present, at a special place which has not yet been found, but I am sure that we will be able to find it. We are told that there will be quite a number of people present. I suggest it would be appreciated if at least some of you could attend that meeting, perhaps in order to answer questions from either the committee or the academic community. It seems to me it would add great interest to our meeting with the universities, were you to be available next Thursday when we meet with them in plenary session. We will have had an opportunity to see what we have said today and to have a more serious look at your report.

Dr. Macdonald: Thank you.

The Chairman: I wish to thank you for your having spent this day with us and, at the same time, I am issuing an invitation to you to come back next week.

Senator Cameron: Before you leave, Mr. Chairman, this business of the supervisory committee raises all kinds of questions in my mind. It certainly does not fit into the existing machinery, and does not fit into any concept I have of the kind of machinery we are likely to recommend should be set up.

Dr. Macdonald: Senator Cameron, I wonder if, in fact, the Treasury Board is not completely free right now to appoint people to advise, or to announce it to anybody?

Senator Cameron: They could hire consultants.

Dr. Macdonald: Do they not, in fact, do that kind of thing?

The Chairman: The trouble is that I suppose you are making something public here in terms of recommendation which has remained secret up to now.

Dr. Sirluck: There was the hope, Mr. Chairman, that it might be more responsible. I am not sure the language is not ambiguous, but there was no thought that this committee is descending to individual awards; it was as between the three major sectors.

The Chairman: Our feeling, or, at least, my feeling is that the Treasury Board should not act alone in deciding whether there should be more money going to the social sciences or to the life sciences or to NRC.

That is why we always come back to this kind of dual approach, which seems to be what is needed in this country, the micro approach, which I referred to this morning and the other more or less general approach which takes into view the public interest and the overall situation.

Dr. Sirluck: I, for one, would certainly prefer to see a system in which, not the Treasury Board, but the whole Cabinet in overt political sessions made such judgments. We were attempting to improve the present rather undercover arrangements.

The Chairman: Anything that could improve the operation of the Treasury Board is highly desirable.

Dr. Sirluck: We meant this as an interim step, before your committee's report.

The Chairman: Again, thank you very much, and I hope we will be able to see you again next Thursday afternoon.

The committee adjourned.



First Session—Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

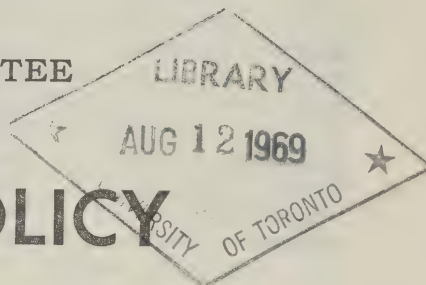
PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY



The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*

The Honourable DONALD CAMERON, *Vice-Chairman*

No. 44

TUESDAY, MAY 27, 1969

WITNESSES:

Association of Universities and Colleges of Canada: Reverend Father Roger Guindon, o.m.i., ex-President; G. C. Andrew, Executive Director, and W. Waines, Associate Executive Director.

University of Dalhousie: Dr. M. J. Keen, Chairman, Department of Geology, University of Dalhousie, Halifax, Nova Scotia.

APPENDIX:

- 60.—Supporting document entitled "A brief submitted to the Study Group sponsored by the Science Council of Canada and the Canada Council on the support of research in the Universities" by the Association of Universities and Colleges of Canada.

MEMBERS OF THE SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—

Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate,
The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,
The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

TUESDAY, May 27, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.05 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Blois, Bourget, Carter, Grosart, Haig, Kinnear, Leonard, Phillips (*Prince*), Robichaud and Yuzyk—(12).

In attendance: Philip J. Pocock, Director of Research (*Physical Science*); Gilles Paquet, Director of Research (*Human Science*).

The following witnesses were heard:

ASSOCIATION OF UNIVERSITIES AND COLLEGES OF CANADA:

Reverend Dr. Roger Guindon, O.M.I., Ex-President;

G. C. Andrew, Executive Lirector, and

W. Waines, Associate Executive Director.

UNIVERSITY OF DALHOUSIE:

Dr. M. J. Keen, Chairman, Department of Geology, University of Dalhousie, Halifax, Nova Scotia.

(A curriculum vitae of each witness follows these Minutes)

The following is printed as an Appendix:

60. Supporting document entitled "A brief submitted to the study group sponsored by the Science Council of Canada and the Canada Council on the support of research in the Universities" by the Association of Universities and Colleges of Canada.

At 12.50 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

CURRICULUM VITAE

Andrew, Geoffrey Clement: Born July 3, 1906; Bayfield, N.S. Education: King's College School, Windsor, N.S.; 1925-29, King's College, Dalhousie University, B.A.; 1933-35, Oxford University, B.A., M.A.; 1962, University of King's College, D.C.L.; 1968, Université Laval D.Lett. Academic and Professional Experience: 1929-30, Master, Rothesay Collegiate School; 1930-33, House Master, Upper Canada College; 1935-42, Senior Housemaster and Teacher of English, Upper Canada College; 1943-45, Secretary, Wartime Information Board, Ottawa; 1945-47, Director, Canadian Information Service, Ottawa; 1947, Chief, Information Division, Department of External Affairs, Ottawa; 1947-53, Professor, Department of English, and Executive Assistant to the President, University of British Columbia; 1953, Carnegie Corporation Grant to study methods of university administration in Canada, the United States, Great Britain and Europe; 1953-62, Professor, Department of English and Dean and Deputy to the President, U.B.C.; 1954, Delegate to Institute of Pacific Relations, Kyoto, Japan; 1959, Member of Committee to advise New Zealand Government on Higher Education; 1962, Invited to observe higher educational development in China; 1962, Executive Director, Canadian Universities Foundation, and National Conference of Canadian Universities and Colleges; 1965, Executive Director, Association of Universities and Colleges of Canada. Associations: Canadian Association for Adult Education; Canadian Institute of International Affairs; Canadian University Service Overseas; United Nations Association. Publications: Articles on Education, International Relations, Literature and the Arts, in a variety of publications.

Guindon, Reverend Dr. Roger, O.M.I. (Oblate of Mary Immaculate). Born: September 26th, 1920, in Ville-Marie, Québec. Studies: Juniorate of the Sacred Heart, 1933-39 and St. Joseph's Scholasticate, Ottawa, 1940-47. Ordained priest in 1946. Further studies at the "Institut d'Études Médiévales de Montréal" in 1949 and 1951; graduate studies in Rome 1951-52; doctorate studies at Fribourg University, Switzerland, 1952-54; Degrees: from the University of Ottawa: B.A., B.Ph., 1942; L.Ph., 1943; S.T.B., 1945; S.T.L., 1947. From Fribourg University: S.T.D. (D.Th.) 1954. Postings and Functions: St. Joseph's Scholasticate: 1947-59; Professor of Moral Theology in the Faculty of Theology, 1947-64; Librarian, 1947-1951; Secretary of the Pastoral Institute in which he was also a professor, 1957-64; Secretary of the Faculty of Theology, 1958. Sedes Sapientiae Centre: 1959-64: Superior and Director of studies in the ecclesiastical faculties; Dean of the Faculty of Theology, 1961-64; Member of the Oblate Education Association, 1961; Member of the Catholic Theological Society of America, 1962; Member of the foundation committee of the Institute of Pastoral Medicine, 1964; President of the foundation committee of the Canadian Society of Theology, 1964. Rector of the University of Ottawa, July 1964; Member, Board of Directors, Ontario Cancer Treatment and Research Foundation, 1964; Member, Board of Directors, Association of Universities and Colleges of Canada, 1965—(President 1967-68); Member, Board of Directors, Ottawa Philharmonic Orchestra, 1965; Member, Board of Trustees, Ottawa Civic Hospital, 1966; Member, Vanier Institute of the Family, 1966; Vice-

Chairman, Committee of Presidents of Universities of Ontario, 1966; Member, Council of the Assoc. of Commonwealth Universities, 1966-68; Member, Ontario Council of Health, August 1967; Member, Tribunal on Bilingual Higher Education in Nova Scotia, 1969; Honorary Doctorate (LL.D.) Trent University (May 1968); Honorary Doctorate (LL.D.) Laurentian University (May 1969); Home Address: 305 Nelson Street, Ottawa 2, Ontario.

Keen, M. J. Educated at Oxford University (B.A., Geology, 1957) and Cambridge University (Ph.D., Geophysics, 1961); Assistant Professor, Institute of Oceanography, Dalhousie University, 1961-1964; Associate Professor, 1964-1969; Professor and Chairman, Department of Geology, Dalhousie University, 1969. Interested in marine geology and marine geophysics. Author of a number of scientific papers and one book, "Introduction to Marine Geology". Age 34.

Waines, W. J., B.A., M.A., LL.D. Born Moosomin, Saskatchewan, October 27, 1901; Educated in public schools, Moosomin, Saskatchewan; taught school one year in Saskatchewan, 1920-21; attended University of Manitoba, B.A. (1924), M.A. (1925); graduate studies at Northwestern University and the University of Chicago; LL.D. (Mar.), 1967. Scholarships, etc.: 1923, Isbister Scholarship, University of Manitoba; 1924, Gold Medal in Political Economy, University of Manitoba; Gold Medal in History, University of Manitoba; Sir Daniel MacMillan Fellowship in History and Political Economy; 1925, Awarded Travelling Fellowship, University of Manitoba. University Appointments: 1926-1927, Instructor, University of Manitoba; 1927-1928, Lecturer, Lake Forest College, Lake Forest, Illinois; 1928-1942, Lecturer, Assistant Professor and Associate Professor, University of Manitoba; 1936-1937, Visiting Lecturer, University of Toronto; 1942-1963, Professor of Economics and Head, Department of Economics and Sociology, University of Manitoba. (1963, resigned as Head of Department, continued as Professor of Economics); 1947-1961, Dean of the Faculty of Arts and Science, University of Manitoba; 1960-1966 (June 30), Vice-President (Academic), University of Manitoba; 1966 (July 1), Associate Director, Association of Universities and Colleges of Canada and Executive Secretary of Social Science Research Council and Humanities Research Council; 1966 (July 1), Dean Emeritus, Faculty of Arts & Science, University of Manitoba. Other Appointments, etc.: 1938, Member of Research Staff, Royal Commission on Dominion-Provincial Relations; 1939, Secretary, Royal Commission on Municipal Finances and Administration of the City of Winnipeg; 1943-1945, Economic Adviser on Post-War Reconstruction to the Government of the Province of Manitoba; 1949-1950, Economic Adviser and Consultant to the Royal Commission on Transportation; 1952-1958, Member, Board of Directors, Central Mortgage and Housing Corporation; 1953, Chairman, Wage Survey Board, City of Winnipeg; 1954, Canadian Delegate to the I.P.R. Conference in Kyoto, Japan; 1946, Chairman of a substantial number of Labour Conciliation Boards, President, Civil Liberties Association of Manitoba; 1952-1954, Chairman, Winnipeg Branch, Canadian Institute of International Affairs; 1952-1953 and 1953-1954, Chairman, Canadian Social Science Research Council; 1957-1958, Economic Adviser to the Government of the Sudan, United Nations, Technical Assistance Administration; 1960 (Summer), Canadian Director, W.U.S.C. Seminar in Israel; 1962 (March), Canadian Delegate to UNESCO-ECLA Conference on Education Santiago, Chile; 1960-1963, Member of Board, Community Chest of Greater Winnipeg; 1961-1966, Member of Canadian Welfare Council Commission on Social Work Education and Personnel. Also, member of the Executive Commit-

tee and Chairman of the Sub-Committee on Undergraduate Education; 1962-1965, Member, Board of Trustees, Manitoba Medical Service; 1965-1966, Member, Winnipeg Police Commission; 1962-1965, Member of Executive Committee, NCCUC; 1965-1966, Member of Board of Directors, AUCC; 1962-1966, Chairman, CUF-AUCC Finance Committee; 1959-1965, Member of Canadian Commonwealth Scholarship and Fellowship Committee. Memberships: The Canadian Political Science Association—President, 1962-1963; The Canadian Historical Association; Canadian Institute of International Affairs. Publications: Federal Public Finance: Canada, Canadian Journal of Economics and Political Science, Vol. 3, No. 2, May 1937; Problems of Public Finance in the Prairie Provinces, C.J.E.P.S., Vol. 3, No. 3, August, 1937; Dominion-Provincial Financial Arrangements: An Examination of Objectives. C.J.E.P.S., Vol. XIX, No. 3, August 1953; Problems of the Drought Area in Western Canada, in Essays in Political Economy, in honour of E. J. Urwick, University of Toronto Press, 1938; Post-War Immigration Policy, the Canadian Banker, Vol. 51, 1944; Provincial Post-War Reconstruction Problems and Policies, Culture, Vol. 5, 1944; Government Control of Raw Material Supplies, The Canadian Credit Institute, Bulletin No. 16, December, 1930; Prairie Population Possibilities. A study prepared for the Royal Commission on Dominion-Provincial Relations. Ottawa, King's Printer, 1939; Public Finance, Encyclopaedia Canadiana; The Role of Education in the Development of Underdeveloped Countries, The Canadian Journal of Economics and Political Science, Vol. XXIX, No. 1, Nov. 1963.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Tuesday, May 27, 1969

The Special Committee on Science Policy met this day at 10.05 a.m.

Senator Maurice Lamontagne (*Chairman*)
in the Chair.

The Chairman: Honourable senators, with our one-day discussion with the Macdonald Group as background, we are beginning this week what we have called our university week.

We are very pleased indeed to welcome this morning the representatives of the Association of Universities and Colleges of Canada. First of all, let me welcome its President, Reverend Father Guindon.

[*Translation*]

At this point, I would also add that it is my pleasure to introduce to you this morning my boss, the President of the Association, who is also President of the University of Ottawa.

I am going to be a good pupil, or a good employee, sir, you may be sure.

[*English*]

I understand that our guests this morning were not in a position to have a full brief approved by the association and that Father Guindon will read an opening statement. Afterwards, we will have the usual discussion. However, the delegation should feel free, if the questions are too indiscreet at this moment, to reconsider or to decline to answer. I am not forcing anybody here. It is a free public forum.

[*Translation*]

Father Guindon.

Reverend Father Roger Guindon, O.M.I.,
Outgoing President of the Association of Universities and Colleges of Canada: Honourable Senators, Mr. Chairman, I am afraid I must make a small correction in what you have just said—I am now the ex-President, I was President last year.

Unfortunately, the other elected members of the governing body were unable to attend this morning.

[*English*]

If I may introduce the other members: these are my good friends, Mr. Geoffrey Andrew, Executive Director of the AUCC. Mr. W. Wainess, Associate Executive-Director, and Mgr. Garneau, Assistant Executive Director of the Association of Universities and Colleges of Canada.

The Association of Universities and Colleges of Canada is a voluntary association of 61 universities and colleges, whose needs it serves in the two languages of instruction, English and French. The association is represented here today by its Past President, as I have indicated, and by the senior officers of the secretariat. Dr. Colin Mackay, President, and Dr. Roger Gaudry, Vice-President, regret their inability to be here because of graduation ceremonies and other commitments. The position of the association with respect to relationships between the universities of Canada and the federal government has been most recently expressed officially in a brief dated April 30, 1968, which the association submitted to the Macdonald study group, sponsored by the Science Council of Canada and the Canada Council, on the support of research in the universities. Copies of this brief have been distributed and are available.

The association has been preparing its response to the Macdonald Report ever since its recent release. It has had its committees on the sciences and on the social sciences and humanities review the recommendations of the Macdonald Report preparatory to having them submitted to the executive heads of all its member institutions on June 25, and to its board of directors on June 26. We hope that at that time the board will make any modifications which it considers desirable, to the position set forth in the brief to the Macdonald working group.

Members of the Senate Committee will note that the recommendations contained in the brief are based on the assumption that the governmental position with respect to these matters is that which was stated in the document submitted by the then Prime Minister, the Honourable Lester B. Pearson, to the delegates to the Federal-Provincial conference of October 1966. That document stated that the federal government had a constitutional responsibility in the fields of research, cultural development, and certain forms of manpower training, and equality of educational opportunity.

Our recommendations also noted the diversity of federal authorities and ministers who currently share responsibilities in these fields; that is to say: the Canada Council reports to Parliament through the Secretary of State; the office of the Secretary of State has an education support division; the federal-provincial arrangement respecting one half of the operating costs of all post-secondary education, is the shared responsibility of the Department of Finance and the Secretary of State; the National Research Council is responsible to the chairman of the Cabinet Committee on Scientific and Industrial Research; the Medical Research Council reports through the Minister of National Health and Welfare; the Science Council reports to Parliament through a designated minister; the Science Secretariat reports to the Privy Council. This list does not, of course, include those departments of government which themselves conduct extensive research operations and make grants.

There would seem to be an urgent need for correlation—if not coordination—of responsibility in these areas.

This could be achieved in a number of ways:

- 1) By developing the education support division of the Secretary of State's Department.

- 2) By bringing all the various responsibilities under one cabinet committee with a parallel body representing the granting and advisory agencies.

- 3) By forming a department or making a minister responsible for the development of science policy, and by having the various existing agencies report to him, or through him, if they currently enjoy the right to report to Parliament.

The AUCC recognizes the nature of our federal society, and accepts the primary responsibility of the provinces for education, but it also recognizes that cultural development and research are aspects of education and involve, deeply, education institutions. We therefore would appreciate the opportunity of studying with appropriate federal and provincial authorities the role which the universities and colleges of Canada should play through research and teaching in the cultural development of Canada. Our member institutions are conscious of the fact that they serve local, provincial, regional and Canada-wide constituencies at the same time as they must also attempt to serve the community of the world of learning itself.

We are not at this time advocating any particular solution in this matter. We are, however, concerned to ensure that the institutions of higher learning in Canada are in a position to work effectively on behalf of all their constituencies, and we are deeply conscious of the fact that in a federal country like Canada national development must include provincial and regional development.

Thank you, Mr. Chairman.

The Chairman: Thank you, Mr. President, or rather, Mr. ex-President. In the Senate we move rather slowly and I am inclined to think all other institutions are similar to us in that respect.

I am not sure how we should approach this matter this morning. You are not in the position at the moment to express any views about the kind of possibilities that you suggest on page 2 of your brief.

Mr. G. C. Andrew, Executive Director, Association of Universities and Colleges of Canada: Well, Mr. Chairman, we have had views expressed in the brief we have now submitted to you as evidence of our previously held positions, and you will find that in the brief to the Macdonald working group. Whether those positions will be modified in the light of the Macdonald Report, we are not in a position to say, but we have no hesitation in discussing the possibilities, if anyone wants to ask questions.

The position we held then, really, was first of all that we felt that the federal Government must have people who are as knowledgeable as the people in the Departments of Education in, for example, the provinces of Quebec and Ontario and who are as con-

cerned about higher education, because the federal Government is committing a vast sum of money to all forms of education and research, and it is a pity if the people who are committing this money are not as well advised as the provincial people are. Actually, the provinces now have better teams of people who are expert in these fields than the federal Government has. We feel rather isolated, as the Association of Universities and Colleges of Canada, because we are the only presence, nationally, on higher education, and, as a matter of fact, the federal Government has to use us, having no other instrument, in a lot of its international relationships in higher education. We are also the only persons to whom a lot of correspondence can be referred. We feel, as we are an interested party, that obviously we cannot expect the Government to accept our advice, though we think our advice is...

The Chairman: Sound and objective.

Mr. Andrew: Yes, sound and objective. Therefore, they should have somebody else's advice in the Public Service that is as well informed as, let us say, the Department of University Affairs in Toronto or, let us say, Mr. Tremblay, Mr. Yves Martin or Mr. Gauthier in the department in Quebec.

These are very well posted people.

If the federal Government does really mean that it has a constitutional responsibility in the field of research and cultural development and an equal responsibility in the field of educational opportunity and manpower training, then it must occupy the territory or else abandon it to the provinces. But we are not sure what the federal Government's posture is.

I think, when you were Secretary of State, Mr. Chairman, the educational portion of that department was established. Since your departure from that portfolio, it has not flourished. I cannot put it clearer than that.

Senator Carter: May I take it, Mr. Chairman, that this is the brief referred to a moment ago in connection with the Macdonald Report?

The Chairman: Yes, I believe our guests this morning have very definite views about the Macdonald study, but, unfortunately, they have not been able to submit those views to their board so that it would be rather embarrassing for them now to tell us in advance—

in effect, to give us a preview—what they will submit to their colleagues.

Senator Carter: We had better not ask any questions about that, then.

The Chairman: I am sure that some of you will try. We will see what happens.

Senator Carter: Mr. Chairman, I was interested in the last speaker's statement that the federal Government should either occupy the territory which it claims or abandon it altogether. I want first of all to sound him out on what he thinks the federal Government should do. Should the federal Government occupy this territory, and, if so, how should it go about doing so? Merely by making money available? Or should it go beyond that?

Mr. Andrew: No. As a matter of fact, I should like to modify that position. When I was talking about having no comparable educational authorities, I should have said that the federal Government has some extremely competent authorities in the field of research and granting. For example, I myself feel that the Canada Council is extremely efficiently staffed by Mr. Boucher and Peter Dwyer. In their fields there are no people more knowledgeable than they. Similarly, I think the National Research Council is well staffed for its particular granting functions. I think the Science Council is moving into the position of being an effective body in terms of science policy, but it is new and has had to move slowly to be efficient in this field.

The federal Government has occupied the position with respect to cultural development in a sense through the Canada Council, but the terms on which it has occupied the position are not quite clear.

The Chairman: And in various other ways to the National Cultural Institution and use programs.

Mr. Andrew: That is right.

Senator Carter: The Macdonald Report has suggested that other councils be set up to cover all the disciplines. Do you think that that is a better way of occupying this territory?

Mr. Andrew: That is the crunch question that our board is going to have to answer—whether it is going to come out in favour of supporting the Macdonald recommendations to divide the councils or whether it is going

to come out in support of its earlier position on undivided councils on page 13 of its brief.

Senator Carter: If you cannot speak for your association or your group, perhaps you could tell us your personal feeling about the recommendation. I will read it to you. It is number 22 and it says "that the present form of NRC grants to university computing centres be discontinued." They recommend that the National Research Council be reconstituted to deal solely with scientific and engineering research, and I think, if I am not mistaken, that they also recommend that the NRC should not provide grants.

Mr. Andrew: The question of whether the NRC should be divided up into an in-house research agency on the one hand, and a granting body on the other is in fact somewhat different from the recommendation that the Canada Council be divided into an art council, a council dealing with the humanities and social science council. The question of separating the in-house aspect is one thing. The question of whether it would serve the claims of industry better in that context is one on which there are differing scientific views. But that is a different question from the Canada Council question.

One of the real problems that our board is going to have to cope with is whether you serve the interfaces between disciplines better by having more councils, or whether you would serve them better by having a united council. I don't know whether you have seen the document the Canada Council released a few days ago in which they took the view very strongly that the Macdonald Committee did not examine fully enough the possibilities of an undivided council in order to make sure that there were fewer things left out such as geography, clinical psychology and things like that.

Senator Carter: They mentioned things like architecture and business administration that probably were not getting proper attention at all.

Mr. Andrew: Well, the argument is as to whether you do better by having one comprehensive body, in which case you will have too much under one roof, or whether it is better to divide them up and possibly miss out some things in the gaps between.

Now I have some views on this particular question, but I am not going to state them

today. I will state them to my board in the discussion. I think that there are arguments on both sides as to which are the more powerful. We will try to release to the chairman of this committee as soon as possible after that our views on the subject, but at this time I think I had better stop there.

Senator Carter: Well, I have read some of the briefs from other universities, and some are in favour of a single body while others do not seem to have any strong feeling one way or the other. But practically all of them say that the federal government should do more than it has been doing. They say that research is so important it cannot be carried out without a sound infrastructure. If you do not provide the structure you start up a vicious circle which perpetuates itself like poverty so that you do not get down to doing research that is worthwhile.

Mr. Andrew: There certainly needs to be a more correlated—I will not say co-ordinated because I am not too fond of that—but there seems to be a great need for a more correlated infrastructure than there is at the present time. Let me give you an illustration of the kind of thing we have had to cope with on an *ad hoc* basis on the past. When the Department of Energy, Mines and Resources announced that it was establishing a research centre on inland waters at Burlington, they did so after consultation with scientists in the field, but the universities of Ontario had not been consulted in their collective capacity, and they felt they had a very great interest in this. They got in touch with us as the Canada-wide agency and we made representations to the department and to Treasury Board, and the result of that was that the department consulted us about getting the Canada-wide interest of the universities in this field. We canvassed the situation very thoroughly and got a committee representing the Canada-wide interests. It was not only of interest to Ontario; Quebec universities were equally interested and some of the western universities were also. As a result of that, we now have an advisory group not only there, but we also have an advisory group to the government on major research installations that involve either the training of graduates or co-operation with university research; and the Treasury Board now has requested all departments planning major research developments to consult with us. Now this is a piece of infrastructure that has grown up out of a

specific need, and the same relationship now exists between ourselves and the Fisheries Research Board. Dr. Waines is responsible for our domestic arrangements and our relationship with our member institutions inside Canada, and Monsignor Garneau is responsible for our external relationships. Dr. Waines has been responsible for developing this piece of infrastructure, but it grows slowly because we have no one body in the federal government to deal with.

Senator Carter: In your opening statement you outlined three possibilities, through the Secretary of State, through a cabinet committee, or through a new department of science policy. Which of these do you think you would prefer?

Mr. Andrew: We really do believe that this is, if I can put it that way, a political decision. This is something for the federal government advised both by its research people and its policy people. I wish also that it were advised by some people with a specific intimate knowledge of higher education. We feel that is something for them to work out with the provinces. Let me give you another illustration indicating that we ourselves over the past three years have invited annually to a meeting three groups of people: representatives of the departments of education, or higher education, who have responsibility for higher education in all the provinces of Canada; representatives of the provincial or regional associations of universities across the country; and representatives of provincial commissions on higher education or post-secondary education. Those three groups have come together to discuss their common interests in inter-provincial and Canada-wide development.

At the last meeting, which was over a year ago now, that composite group authorized us, the AUCC, to retain a man to explore, with the provinces, with the federal authorities, with the provincial and regional councils of universities, with the provincial commissions and with the council of ministers of education, what their continuing interest was in developing a mechanism to help plan inter-provincial and Canada-wide developments in this field. That inquiry is currently going on. We hope to have a report on it by the fall, but it is left to the private, voluntary organization to take these initiatives, and I just do not think that is good enough.

Senator Carter: Eventually, the federal involvement boils down to dollars and cents, X dollars or X million dollars. Somebody has to make a decision as to: How are we going to share this out? What proportion of this should go into basic research, pure research; how much should go into research and development?

Mr. Andrew: Yes.

Senator Carter: And how much of the pure research should be devoted to the humanities, how much to the social sciences, and so on. How do you think these decisions should be made? Essentially, they are political decisions; they have to be made by one of these groups, or some minister or somebody.

Mr. Andrew: You refer to a rather complex infrastructure. In the first place, within this infrastructure, I think, the independence of the granting agency has to be guaranteed. As you will be aware, there was some public controversy about the Canada Council with regard to a couple of grants recently, and I would like to say that we in the universities feel that unless the Canada Council gives these grants totally free from any inquiry about the political orientation of the people who receive them for study or research, it is on a slippery slope.

So, first of all, the granting agencies have to be protected, and their function, I think, is that of being directed by a lay body of responsible citizens, as they are now. They may have quite good and sufficient reasons to have different granting policies for the humanities and the social sciences than for the sciences.

So, as is recommended by the Macdonald Report and as is recommended by us, a correlating committee of the executive officers of the granting agencies is one first step in the development of the infrastructure, so that they can explain to government that their policies, by agreement between them, vary in this and this respect.

Then, in the complex of the infrastructure, there needs to be also a relationship between the advisory policy bodies. For example, one of the things that has been considered by the Macdonald Committee is whether the Science Council should have its terms of reference expanded and have its membership broadened to embrace both the human sciences, les sciences humaines, and the social sciences; or whether it is better to confine them to the

sciences, and either to give that responsibility to the Canada Council or create another body. This is the second part of it. The granting agencies is one, and they really should be as free as independent citizens controlling them on behalf of Parliament can make them.

The second thing is that the Government needs advice on long-term policies in all these sciences. Whether they achieve that best by one or two councils is a matter of opinion. There are advantages and disadvantages in both.

Then, as a matter of fact, the question of whether at the Cabinet level you get better attention by a cabinet committee than you do by having a minister make or break his reputation on it, is, as you know, one of the age-long political questions. On that one, again I must say that I have always tended to think, in a personal way, that it is a good thing if you can put a minister on the spot; but there are other ways of doing it. The Cabinet already has a committee on scientific and industrial research. Whether you could have an effective Cabinet committee, all the way from the humanities through to engineering, I am not at all sure. But, again, this will be one of the questions the board of the AUCC will be considering.

I am sorry to take so long, but, as I see it, there are three levels to the infrastructure: the granting agencies; the correlating high-level civil servants; and the Cabinet committee or minister.

Senator Carter: My final question is a double-barrelled one. I come back to your original statement, when you said that the federal Government should occupy its territory or get out of it altogether. I gather from that that you do not feel the federal Government is fully discharging its claims to the territory it wants to or says it should occupy. Supposing the federal Government took you at your word and said: "Fine. We will get out." How do you see that gap being filled?

Mr. Andrew: I am delighted to answer that question, and I am sorry to be hogging it, but I invite my colleagues to join in.

Your question No. 1 gives me the opportunity to repeat something that we have wanted to ever since the Bladen Report, which recommended that the federal Government should not only pay grants lent up to 30 per

cent for overhead costs on research. It based its argument on the fact that if the federal Government, in making grants for research, does not pay the indirect costs of research as well, then, in effect, it is handing on to the provinces the indirect costs of research in a way over which the provinces have no financial control; and if the Government does not come up with this kind of thing one of the provinces will in fact say: "Let us have research money by way of fiscal transfer too"—in which case the federal Government is not in a position to exercise its responsibility with respect to research for scientific, including cultural, development.

The second question is: If the federal Government does not occupy, what is the alternative? The alternative is to abandon the whole field of cultural relations, research, equality of educational opportunity, and high level manpower training totally to the provinces, and that raises the question of whether we can continue to think of ourselves as a country.

Senator Carter: Thank you.

Senator Grosart: Mr. Chairman, I have some understanding and considerable sympathy with the insistence we get from the science community on their independence in respect of various aspects of science policy, particularly in the granting function. To that I can only say that everybody else has the same desire, including the military. We have very good reasons for saying that we cannot just give the military the money and let them set up a granting committee, and develop what weapons they like, and what weapons anybody else they call in likes. I think the same applies in this field, and I say that for two reasons.

One reason, of course, has been stated very often, and that is that the ultimate responsibility is political. Given the problems of any kind of democratic government we have to remember that in the long run the responsibility for all decisions is placed on a group of laymen, the members of Parliament.

The second reason why I have some concern about the validity of insistence on total independence in this area is that these are public funds, and, rightly or wrongly—and we seem to believe in it—there must be an accounting right down to the last cent. I objected to the suggestion in one brief that there should be a cut-off point on the internal

audit of the universities beyond which the auditor general or a parliamentary committee should not be allowed to go. I disagree with that. This, of course, I think comes back to the essential problem that we are concerned with, and that is the in-put of scientific advice into the political decision.

You mentioned, sir, three main levels—the granting, the correlation, and the political decision-making. You did not include there, as most people do, the advisory function. Would you care to comment on where you see the advisory function from the science community fitting in to the political decision-making?

Mr. Andrew: I am sorry if I did not make that clear. I meant that in terms of the correlating group being an advisory group to the political group. It seems to me that in the correlating group there may be a need for two bodies of correlators—the correlators who are the executive officers of the granting agencies, and the correlators who are represented at the present time by the Science Council for the pure and applied sciences, possibly embracing the humanities and the social sciences, and possibly another which is at the level of advice to the political authority.

The Chairman: These are two different kinds of advice. One is as to policy, and the other is as to allocation of funds.

Mr. Andrew: That is right.

Senator Grosart: Then you have a third with respect to administration. You have to have some kind of overview of the administration.

Mr. Andrew: That is right.

Senator Grosart: That is why I raise this question of independence in the particular context of your own recommendation, and you might answer my question by filling out a little more the recommendation you made on page 10 of your submission to the Macdonald group. In the middle paragraph on that page you refer to a form of a liaison committee which would be advisory to a minister of the Crown. You then rough out the functions, and I might say that I think they are excellent. They are ones that somebody must undertake, and are, for instance:

To consider and from time to time advise the minister with respect to the annual rate of increase for research grants and whether or not this should be the same for all granting agencies.

This is the overall picture.

To recommend to government, policies with respect to overhead on research grants and how such overhead should be determined for the various fields of research.

I am sure we all agree with the basic concept that you have brought up, except that we must remember that in those indirect costs you speak of the federal Government is already the largest contributor. That would be on the side of the federal Government.

Mr. Andrew: No, I do not think so. One could argue at the moment that in the present fiscal arrangement with the provinces the federal Government is liable to pay one-half the indirect costs of research over and above what it pays in direct grants, but the direct grants do not cover the indirect costs of research. The Macdonald Report, as a matter of fact, recommends even more than our recommendation here.

Senator Grosart: I do not want to go into that in depth because I agree basically with your recommendation, except that you say that the Macdonald Report recommends more. Your recommendation is 30 per cent, is it not?

Mr. Andrew: It recommends a percentage in addition to the full costs of research, and the full costs are frequently more than the grants. Both the National Research Council and the Canada Council have tended to regard their grants as enabling grants, and not full grants. I realize that I am taking on a constitutional lawyer here, but on a constitutional point I have always thought that the functions of boards of governors of universities and, for example, the boards of the Canada Council and the National Research Council, and the reason for scrutiny by them rather than by Parliament, was what in selecting, as the Government usually does, eminent persons to sit on them, they are saying: "We are deliberately going to remove the possibility of political influence that might be brought to bear on the kinds of grants, or on the boards of governors of universities in respect to the kinds of subjects that are studied." I do

not want to be invidious, but I could point out occasions on which the political authorities have specifically withheld grants from university faculties. I thought that the whole constitutional theory was that the accountability, which no university disputes at all, in detailed scrutiny had to be handled by a board that represented the public but which was not political in its orientation. This then enabled public accountability to be called for line upon line; whereas the relationship between, let us say, in Ontario, the Association of Universities—the whole group of universities—and government is then governed by an advisory committee which has devised a formula by which there shall not be line upon line accounting to political authorities which might open the door to the political authorities' saying: "We do not like Professor X. Therefore, there will be no money for that department." I thought that that was the constitutional theory. Is there any difference between us in respect to that?

Senator Grosart: No. If I may say so, I am not greatly concerned with constitutional theory here because I have always believed that if we can come up with the solution we can handle the constitution later. I do not want to get involved in that too much. The principle of accountability and how it is done is important, but less important, in my view, than adherence to the principle that the accounts must be open to parliamentary scrutiny. It is all right to say that boards of governors and university accountants are very capable and very honest, but a board of governors does not present its estimates and does not appear before Parliament; they are pretty well shielded from the kind of scrutiny some of us thing called a university commission or com- of our system in the matter of expenditure of public funds. However, I do not want to go into that.

Mr. Andrew: I should like to make this point. Saskatchewan has chosen to do it one way, but Alberta, Manitoba, Ontario, New Brunswick and Nova Scotia all have something called a university commissioner committee, all appointed by the government, and their purpose is to undertake this line upon line scrutiny of the budgets on behalf of the government in order to make sure the government itself does not get involved with what in the university curriculum it will support and what it will not support. It seems to me that the collective political wisdom of most of the provinces of Canada, as well as

what most of them inherited from the practice in the United Kingdom, has been to set up a buffer body to scrutinize in detail and thereby obtain public accountability without that public accountability being directly exercised in a way that might become political.

Senator Grosart: If we are apart at all I think it is only on details.

Mr. Andrew: I see.

Senator Grosart: I am more concerned with the method by which the decision is made and the amount of detail that goes into the basic political decision. That is why I am interested in this committee you suggest and the second of the responsibilities you would give to it. The third is:

To recommend to government which agencies should receive appropriations for research support to each academic discipline...

(4) To recommend to government the appropriate levels for support of research in those areas which encompass a wide range of scientific fields...

(5) To discuss the grant-giving mechanisms used by the grant-giving agencies.

This liaison advisory committee, as I think you call it, is to report to a minister. What happens then? This board advises the minister on these broad areas?

Mr. Andrew: That is right.

Senator Grosart: Then what happens?

Mr. Andrew: If it is a matter of policy the minister takes it to the Cabinet; if it is a matter of amount he takes it to the Treasury Board, I suppose.

Senator Grosart: Assuming that the input of science is there and a political decision can be made, then what happens? How does the science come out of the science policy decision? Let me give you an example. The MacDonald Report suggested first of all three main agencies and then found in necessary to fill in the gaps with a lot of others, so we wind up just about where we start. How do you see this filtering down? This decision is made. Do you see the departments and agencies still operating as they are operating? Do you see the NRC operating as it is operating? Do you see the Science Council operating as it operates now? Similarly the Science

Secretariat? Let us say the political decisions are made; they meet the five items on page 11 of your brief. I want to know what happens then.

Mr. Andrew: Let us take the National Research Council as an example of a grant-giving agency. Without at this time prejudicing the AUCC board decision whether to support one or two agencies—the ideal is two agencies—the National Research Council started off with a policy of merely being permissive and responding to individual scholars' requests. In recent years it has started making a series of grants to institutions, strategic and special development grants and so on. It seemed to us at the time of writing this brief that this kind of development was highly desirable. I come back to the last remark in our preliminary statement. We believe that in a federal country like Canada national development must embrace the concept of regional development for the health of the scholarly community.

As a matter of fact, I disagree with one of the emphases in the Canada Council presentation. I think the scholarly community consists of both scholars and institutions, and the granting agencies, both the Canada Council and the National Research Council, should divide their moneys up in such a way that they separate applications made to them, and also give consideration to strategic grants to stimulate research in areas in which the cultural development of Canada requires it. Just as we now have a department of government concerned with regional inequalities, so we should have in the concepts of the granting agencies; I think they should be adjusted in terms of what I might call contemporary political wisdom. I am myself very keenly in favour of not dividing the scholarly community, not saying that the scholarly community is only scholars and not institutions, but rather saying that the scholarly community is a combination of scholars and institutions. We do not really get any high level development by grants to individual scholars alone unless the university commits itself over a long period of time to this kind of development.

My answer to your question is this. Once the device is made, I think the result should be some changes in granting policies to embrace what I might call the national interest in such fields as northern studies, communications and transportation. Let us take northern studies as an illustration. There are about

seven or eight institutes of northern studies—in British Columbia, Alberta, Saskatchewan, Manitoba, McGill and Laval—and none of them is really of international repute.

I think it is shocking, the little that has been done to stimulate northern studies in Canada, particularly when the north is becoming really very much more important than it was ever before, politically and otherwise—it is shocking that the national interest in the north should not have received greater attention in the field of research. There is room, if I can put it this way, for the political authority to indicate its interest in research to the granting agencies instead of the granting agencies being merely responsive to individual requests.

Senator Grosart: I would like to find out how far you see this advisory committee going. Do you see it, for example, advising the minister as to the total federal Government requirement for the funding of research, R and D in its widest sense?

The Chairman: Or only for universities?

Senator Grosart: In total. It has to be. This is the whole point. It has to be in total or you cannot determine what the universities' share is to be. That would, of course, be my second question.

Mr. Andrew: My answer to that question is this: the committee that is envisaged here is specifically concerned with university support and research in the universities. The whole business of attempting to co-ordinate in that way, let us say, the in-house of the Department of Agriculture, Department of Forestry and Department of Fisheries, except that part of it in the universities, is beyond Government and the whole assortment of ministers would never allow one group to detail what should be done in applied research in the Department of Agriculture.

This committee should recommend to the Government the funds they consider desirable in the fields of research in ties in order to fulfill the Government's obligations for cultural development and research in its broadest sense in the national interest. Now, how you manage to handle the balance between industrial research, university research, and in-house research within Government, seems to me to be really the function of the Science Council as conceived in that field. It should take an overview of what moneys are

expended in all the departments in university research, and so on, and say that there seems to be a disproportion there. We are not supporting industrial research enough.

Senator Grosart: Can you tell me who is going to do this? It would seem to me meaningless to say that we need X dollars this year in research in universities, unless that is related to the total national science policy, which is what this committee is particularly concerned with. Do you see then a similar council for industrial grants, funding research in industry and another council to supervise departmental agencies—

Mr. Andrew: Advise?

Senator Grosart: Advise or let us say super-advise.

Mr. Andrew: I see two functions to be performed. One is the advisory function on the relative emphasis between in-house research, university research, and industrial research.

Senator Grosart: Why does that?

Mr. Andrew: The Science Council.

Senator Grosart: The Science Council told us in very clear terms that they are not interested in making short-term political recommendations.

Mr. Andrew: It seems to us that the trend has gone too much in one way and should be corrected and go somewhat in another way. They should not be concerned with specific budgets, because as a matter of fact if they try to do that we would have every department of Government down their throats.

Senator Grosart: All right, every department of Government is going to be down somebody's throat if this job is done properly.

Mr. Andrew: The Treasury Board is the legitimate body.

Senator Grosart: Almost every witness that we have had said the big problem is that the Treasury Board is making science policy. Surely you are not suggesting that the breakdown between federal funding of research in these various segments should be done by Treasury?

Mr. Andrew: No. It has to be. In the last months it has been done by the Treasury Board. They are the people who talk amounts. The Science Council and the Canada Council

or equivalent body, representing the humanities and social sciences, are the people who say that we are not supporting regional development enough and are not supporting industrial research enough or supporting this too much. In the last analysis it really is the Treasury Board that has to say, in terms of this year's budget—until we get onto a three or five-year budget—this is how we interpret the advice we have received on general policies.

The Chairman: It seems to me that you are really advocating the establishment of a federal foundation in relation to research in universities.

Mr. Andrew: No, I am not, because I come back to it. If it seems to sound that way I want to correct that impression by drawing attention to the fact that we are keeping the three options open and those options were the ones we stated in our opening paper. I am not recommending that at all. The function of this body, which has been referred to, is a correlating function, not a co-ordinating function. I keep on distinguishing between these two because it seems to me it is necessary to correlate policies without having identical co-ordinated policies.

Senator Grosart: I would like to get back to this committee in its limited role in advising the Government on the funding of research in universities. Would you see it as saying to the Government "X dollars is the required amount this year." Would you see it going one step further and say that this should be roughly divided from the point of view of the university and so many dollars should be allocated for the teaching and institutional functions and so much for project research?

Mr. Andrew: No, I would not. I would say that this committee should, as a committee, go to the Government and say that we are representing the granting agencies and that the Canada Council hopes for an escalation this year of 30 per cent or so much money. We feel that is a perfectly appropriate amount in relation to the amount we feel the National Research Council and the Health Science or Medical Research Council require. We also feel that there is ample justification for differential rates of escalation on the basis of their past performance and the kinds of applications in front of them and for the needs for the stimulation of research through regional development, and so on. In short, the

correlation is merely to assure the Government that not only have each of the granting agencies thought through their position carefully, but that they have explained their position to each other so that the Government knows they are not being competitive. Each knows what the other is doing. That is why I say correlation rather than co-ordination.

Senator Grosart: I do not quite follow you on the difference between correlation and co-ordination, because if you are suggesting that correlation is of the lesser magnitude of control then I say I am all for co-ordination if it is the higher magnitude of control.

Mr. Andrew: The reason I believe in correlation rather than co-ordination is that I feel that people who are asked by the Government to serve on the Canada Council, and National Research and Medical Research Council, as soon as you superimpose a body, negatives their advice and substitutes another level of advice. You have thus wiped out the utility of the Government using responsible citizens in this context.

Senator Grosart: That means that every royal commission should have resigned in protest long ago. The Government does not...

Mr. Andrew: The Government does not have to take the advice of the correlation committee. It can sharpen its pencils or its knives. But the correlating committee is at least expressing the needs of the people the Government invited to serve them. The Government can at that point cut down the requests as it in fact does, after discussion; but the correlation is merely to show that the needs of all have been discussed together.

Senator Grosart: Are you not really then going back to a national science policy "in response", which is the next step to what we have been told it is, "by accident"? Why should a government be put in the position of saying "we merely respond"? Let me make it more specific. If Mr. Tremblay happened, on a CBC panel show, to ask a federal minister how much of the funding of universities is for education, (that is institutional), and how much is for project research, and why, where would the minister get the information that he would need to answer that question? It seems to me that it is quite a proper question: How are you using the money? Are you

using the public funds to build up the educational level of the universities generally, particularly in science and in the cultural field, or are you using the universities to carry out specific political goals?"

I am not asking you to discuss the theory, but where does the advice come from, where does the minister get the information so that he may answer that question, and many others relating to it?

Mr. Andrew: I think the minister has to answer the question in relation to the expressed policies and granting policies of the granting agencies.

To carry that a little further, Mr. Tremblay's purpose in asking that question is that he himself believes, and has said so many times, that one cannot distinguish between cultural development and education. His conclusion from that is that, both are exclusively in the provincial domain.

Senator Grosart: Yes?

Mr. Andrew: The federal government must have some counter to that, and the counter has to be, if it is going to be a counter at all, that although cultural development and education overlap, the federal Government has within its jurisdiction, and in fields like external affairs, northern affairs, and so on, its specific goals, as well as general goals. It has got specific goals that are represented by departments of Government and these general goals are represented by the support of research and cultural development.

Therefore, in the exact pursuit of these goals, it is not necessary for us to distinguish how much is what one might call contract or project research and how much is for cultural development. That is the answer.

It seems to me it is the only answer that the federal Government, in pursuit of its expressed constitutional responsibility, can give.

Senator Grosart: Leaving aside the constitutional aspect—that was not the purpose of my question...

Mr. Andrew: I think it was the purpose of Mr. Tremblay's question.

Senator Grosart: Mr. Tremblay might want the information as a citizen. I might want it. I might want to know what our national

science policy is in respect to the funding of research in universities, how it is broken down between institutional grants and specific mission-oriented, project oriented research. I might want to know; it is my money.

Mr. Andrew: Actually, the Science Secretariat probably could say. I see the former head of the Science Secretariat here. Perhaps he can answer the question for me. I think it is a function of the Science Secretariat to look at the research budgets of the departments and say to the Government, so much money has been expended in the last year for project research, so much money was expended by the granting agencies for development research, so much was spent on responding to individual requests.

I think there is no trick to that. I think the Government should have that information readily at its fingertips, through the Science Secretariat.

Senator Grosart: The fact is that we do not have it. Over and over again in these proceedings, one of our great problems is that we do not have the information.

Mr. Andrew: Has the Science Secretariat been here?

Senator Grosart: Yes, the Science Secretariat has been here. As a matter of fact, when they first came before us they were the Secretariat of the Science Council. That is how long or how short a time ago it was, depending on your view of the chronology of the development of national science policy. May I ask you another question, leaving that one?

The Chairman: It is only part of the story, though.

Senator Grosart: The answer seems to be that the Science Secretariat may come up with the answer. Earlier, in referring to a question, you suggested we might ask the National Research Council. On another one, on science policy, the suggestion was to ask the National Research Council. I would not want to be the minister if he has to take this of way to get in the information on the total policy aspects of the breakdown of the millions of dollars of public funds that he is responsible for.

In regard to this committee which would be advising the Government merely on funding

in the universities, would it perhaps go so far as to say that all pure research should be done in the university, or most of it, and university research should be completely free of applied science goals? This is a recommendation, for example, which will come before us in the brief of the association of Graduate Schools. Would it go so far as to say that such and such a percentage of the total funding in universities should go into basic or fundamental research, none should go into applied, or so much should go into applied? Would this be one of the functions, to give this kind of advice to the minister?

Mr. Andrew: I would think it would give advice to the minister in this field, based upon the granting policies that have been carefully thought out and adopted by the granting agencies. And if this were one of the policies adopted by the granting agencies, or by one of the granting agencies, it may say, we feel that in such and such a field this might be the policy—let us say, in science it might be the policy but in the humanities and social science it might not be the policy, that we have not good and sufficient reasons for a variation in the policies as between these two.

Senator Grosart: I am not objecting to that, but what I am suggesting to you, is that there must be responsibility "somewhere" for advice to the political decision maker, as to these broad breakdowns?

Mr. Andrew: That is right.

Senator Grosart: He must be able to answer the question, if someone says, you are putting all your money into basic research in universities and I do not think this makes sense.

Again, will this committee give him this kind of advice? If not, who will? These are policy elements. Everyone in science is asking for a statement of priorities.

Everybody also says they want to be left alone and be independent. All they want is the money. This is the dilemma.

Now, I understand it from the point of view of the universities; I understand it from the point of view of the military. The military are frustrated. They say that everywhere they go because there is always somebody saying that they must not do this or that. They must not escalate this war. They must have a conventional war. But the military say, "We don't want it to be conventional. We would

like you to give us the money and let us finish the job." But the politicians say no, because they have to consider the public will and they have to consider the climate.

Mr. Andrew: That is right.

Senator Grosart: And surely this applies in science.

Mr. Andrew: I totally agree with you, and our brief is to the effect that there should be exact kinds of policy control. We have suggested three different kinds of alternative ways in which policy control can be established.

Now, I have been trying to fit the existing agencies into the policy control picture, as you have been. I understood, really, that in the fields of science and applied science the Science Council was supposed to be the agency that gave advice about long-term trends. In short-term amounts to fit into the long-term trends, this is the function envisaged for this correlating committee of mine. But its recommendations should be considered by the political authority in terms of the advice it gets out of long-term trends.

Senator Grosart: The problem is, of course, that the minister needs desperately some advice tomorrow morning. He has got to decide about ING tomorrow morning.

Mr. Andrew: No, as a matter of fact, he does not. Because, you know, they fiddled about with ING for months and months and with the Queen Elizabeth Observatory, too. Actually, if they had consulted us about these things we would have engaged the whole academic community in advising, but this was before the inland waters research matter. We now have a mechanism for trying to advise the Government about these matters from the point of view of the total academic community.

Senator Grosart: My point is, you see, that the minister has to have advice at least once a year.

Mr. Andrew: That is right.

Senator Grosart: If the minister is what I think you envisage here, he must be able to go to cabinet and say, "Here is the total amount we have to break out to fund research generally. Here is the total amount

that should go into universities and here is why."

I am not satisfied that it is enough for him to say, "Well, I have looked at what the Canada Council recommended, what the NRC and everybody else recommended, and my advisory committee thinks it is all right." Then, if somebody said to him, "Well, did your advisory committee initiate anything? Was your advisory committee concerned because the Macdonald Report said that if a university does not recognize a discipline it does not exist as a discipline; it does not exist so far as the Government is concerned?" This is what the report tells us. This to me is the problem.

The minister, if he is going to be the kind of minister who will make national science policy a vibrant mechanism in the public interest, has got to initiate policy. My suggestion is that somewhere you have to have somebody who can say what the policy is for all granters, what the broad policy is, and though you may want to make exceptions and so on, by and large this is what the Government policy is and this is where the money is to go.

Mr. Andrew: Okay.

Senator Grosart: Do you see your committee doing that?

Mr. Andrew: No, not this committee.

Senator Grosart: Then who?

Mr. Andrew: All right. If you take our option three, and I am not personally advocating this, that there be a minister responsible, the minister would have all these bodies—the Science Council, the granting agencies, the correlating committee—all reporting to him and then, as a matter of fact, he could create any other advisory agencies that he wished to to ensure that he had the advice that would enable him to introduce initiatives, but even so he would not have as tough a job, even with all these agencies reporting to him, as, let us say, the Minister of Energy, Mines and Resources has at the present time with all the agencies that report to him. He has to balance their claims out.

My point here is that with all the mechanisms that even Macdonald recommends, and certainly all the mechanisms that we recommend, the minister, if he felt there

was a hiatus, or something missing in the purview that he wanted to have over the operations, could create or might have to create, assuming the science policy was not changed, an advisory committee to himself on the humanities and social sciences, or he might have to embrace that body of advice within the Science Council in order to get the information he needs in order to initiate the policy he wants.

Senator Bourget: Who would then be the final adviser to the minister? If I understand your definition here, different agencies will submit their estimates to the minister, for example, and then the minister will have all that information in front of him.

Mr. Andrew: Yes.

Senator Bourget: Who finally will advise him what to take, what to recommend to the Treasury Board or what should be dropped out?

Mr. Andrew: In that case I come back to my earlier statement which is that the federal Government, although it has expert advisors on certain kinds of research and cultural development, has not got at the present time people who are the equivalent, so to speak, of Mr. Tremblay, Yves Martin, Germaine Gauthier, Douglas Wright, Edward Stewart and so on. In short, he needs some top level higher educational advisers. That is all.

Senator Bourget: So that they would be a final advisory committee to the minister.

Mr. Andrew: Is this not what happens in any government department?

Senator Phillips (Prince): Mr. Chairman, I was rather intrigued by the first purpose of the committee, as mentioned on page 11 of the brief. It mentions considering from time to time and advising the minister with respect to the annual rate of increase for research grants. I wonder why they feel that the research grants must be increased each year.

Mr. Andrew: Simply because the country is growing and it is annually becoming more complex. Moreover, the constituency they are serving, the scholars of Canada, is increasing each year, and this was written at a time when the Government for a few years had a policy of increasing 33 per cent. I think that was the percentage increase initiated by the chairman of this committee. But whether it is

amounts or annual rates of escalation does not matter; government policies change from time to time.

Senator Phillips (Prince): Basically, I was interested in whether you would tie this to the increase in gross national product or the increase in the budget.

Mr. Andrew: No, I would tie it to the increase in the areas of federal concern. For example, assuming the federal government got really excited about the north, I would expect a substantial increase in the first year to do even a tithe of what the Russians have done by establishing research institutes in their north and tying them in with university research. So that actually the rate of increase should be related to the areas of prime federal concern plus the escalation in worthy applications from engaged scholars.

Senator Carter: I have a question which is supplementary to something long gone past. Coming back to this committee that you would set up to do the correlating, how do you envisage this committee going about its business? Would you have it authorized to receive or to compile national inventories from every university setting forth its budget and its projections for a period and then comparing these to see what overlapping or duplication exists? How would your committee function?

Mr. Andrew: Well, really a correlating committee of granting agencies would, I suggest, come back to a granting agency. For example the National Research Council knows now on the basis of the applications it has received over the last three to five years what the rate of escalations in those applications is, so that it knows pretty well how much money it will need to respond to some percentage of worthy applications. It also knows, but not accurately, the amount of money it could usefully spend to make development grants to universities for areas of national concern. The same applies to the Canada Council. As a matter of fact part of its brief was saying how the applications had escalated and what areas it was attempting cover and so on, and it has not yet adopted as a policy the making of grants, except to libraries, for major developments of regional concern. Therefore the committee would in effect be relating to government that those were the differing rates of escalation between the various constituencies of the granting agencies in areas

of common concern and would set out the gaps between them, let us say geography, education, psychology and so on. It would point out that it has to make an effort to fill these gaps and that it has considered the individual requests and that it considers that the individual requests should go to such and such an extent to meet the gaps between the agencies as well as to fulfill the expectations of the community. It is merely an explanatory function.

Senator Carter: But what would happen if there were three or four universities covering the same ground in research?

Mr. Andrew: This is where what I call the process of self-selection comes in and this is why I think that no university will ever make a major development of international repute on grants from outside alone. It has to commit itself. Let us take northern studies for example; I think the granting agencies over a few years would be able to estimate which of the universities now having institutes of northern studies seems to be most committed from provincial sources as well as federal sources to achieve something of international stature, and over a few years the grants would tend to concentrate on that. If I may give another example, the Canada Council has a policy in the arts of supporting a few centres of excellence rather than dispersing its funds over a wide area. They support the Toronto Symphony, the Montreal Symphony and the Vancouver Symphony rather than the Chilliwack Boys Band. I hope I am not quoted in the Press as saying this. I am not against Chilliwack in the least; it is one of my favourite towns. But it is not a centre of artistic excellence. The same thing would apply here; the government should not select the universities, but it should look to the universities to self-select themselves, and they must keep in mind that they cannot deploy their resources in every direction. But if one university shows that northern development is of particular interest, then it will obtain the federal money available.

Senator Carter: Would your committee concern itself with projects going on over a number of years without leading anywhere?

Mr. Andrew: It would try to keep under review the expenditure of money in relation to the developments that it is able to perceive.

Senator Carter: That would be a function of correlating, wouldn't it?

Mr. Andrew: Yes.

The Chairman: We have been told and I think we all agree there must be an area where the main criterion when we come to decide on grants should be scientific merit. We have also been told that that criterion at the moment is not always effectively applied and that young people get grants to start with—which is very desirable—but once they are on the list they can go back and ask for more each year without any kind of quality audit or any kind of effective appraisal of the output.

Mr. Andrew: I think you have to have periodic appraisals of output. Whether they have to be annual audits is another matter. One of the things you have to keep in mind if you are going to give a grant for a complex project, is that you are not going to see tremendous results for one, two or three years. Some grants should be given on that basis. But then you should have a severe audit in three years to ascertain the results at that time. It seems to me there are other things besides academic and scientific merit that have to be weighed. Let us take a specific example; oceanography certainly should be developed in British Columbia, Nova Scotia and Quebec.

Senator Carter: I think you should add Newfoundland.

Mr. Andrew: Yes, thank you.

Reverend Father Guindon: I think we have to be a little careful when we are using the word "scientific." Every century has a word which becomes a kind of mythological word, and we are now coming into research as being a kind of mythology that we all adore. The kind of sacred cow is changing over the years.

One of the reasons why the universities would like to have as much autonomy as is compatible with public accountability is that there is a number of fields which have not yet proved themselves as being rentable for the Gross National Product and which should be explored. We have, among the members of our staffs, people who are interested in projects which do not immediately capture the attention of the public or even of the politician. Maybe it is only with a stretch of the imagination that some people will think of,

say, the writing of poetry as scientific, but writing poetry is as scientific as analyzing oceanography or as going to the moon.

Senator Grosart: It depends on the poet.

Mr. Andrew: It also depends on the scientist.

Senator Grosart: That was my inference.

Reverend Father Guindon: We are developing a fine world, but everyone becomes alienated. There is a real problem for research which is as important as developing research in technology, and this is why we would like the different granting agencies to get together before the advice is brought to the minister, because they are intelligent people, and maybe one of them is so concerned with his own field that he does not realize what is going on or what are the requirements in other fields, and we want them to get together more.

Another point—and this has been said of the United States and it could be said eventually of Canada—with regard to this insistence on research and the research grants given to the universities, is that if they do not cover the whole cost of the research, then the money has to be found somewhere else, because the universities have only a certain amount of money, and then it is the teaching which suffers. If any element of the university is promoted without having regard to the other elements, there is the risk of breaking down the university, and right now in research grants that we are receiving, some areas are receiving more, other areas are receiving less, and yet others are receiving none. We have to be able to try to treat equitably all the members of our staff. Some of them can have supplementary revenue, with research contracts, and others cannot. It is as important for Canada that each and every one of them be given a fair chance to develop in his own field. Of course, they will not all get as much money as each other. People in the humanities are never going to get as much money as those in engineering or the medical field or the pure sciences, but they have to be recognized; and this is one of our concerns, that whatever be the mechanics, there be some funds available to provide them with an opportunity of proving themselves.

Senator Grosart: I would agree with that entirely, but again—to come back to somebody at the top saying, “All right, the arts are part of this whole picture. Therefore, a proportion of the total is to go to the arts”—we have the Macdonald study saying, “Take it out of the Canada Council and take it out of this field entirely; it is a mistake to mix up the humanities and the arts.” It seems to me a trend in the wrong direction. I would like to see some kind of description of the total picture and somebody in a position to decide what are the total finding requirements of R&D. I do not see how you are going to get this with merely a response mechanism. I think there has to be an overview at some point, so that you can say, “This is it, and this requires so much money”—whether as a percentage of the GNP or something else.

The Chairman: When you speak about, to use the term of the Macdonald Report, the strategic grants, let us say, would you go as far as enabling the minister in charge to say to the Canada Council, for instance, “You will get that amount of money for those specific grants”?—of course, on the advice of the Canada Council, presumably or the advisory committee.

Mr. Andrew: That is right. I think the minister should be in a position to indicate the directions in which the Government of Canada feels the national interest needs to be served. I think that it should be based on the advice not only of the Canada Council but also of this small family of people who really know the potentialities of the universities in relation to the in-house research, and so on.

When you consider the expertise that is available to the Minister of Finance in this country, the high-level people, and the expertise that is available to the Secretary of State for External Affairs, and then consider the relative chaos that now exists in, as we have indicated in our opening statement, the number of bodies that report to the number of ministers, this needs to be pulled together, and there needs to be an overview, and the needs to be exactly what you are both saying. We, in our way, have been saying that we are concerned, simply because universities existing from coast to coast—and, for the most part, they are now organized into provincial systems of higher education—have to serve the provinces' needs, the local needs and the world of learning.

We also hope that, by agreement between the federal Government and the provinces, they can be effective instruments for serving the national needs on a regional and provincial basis, and we cannot do this effectively unless the political machinery makes it possible.

The Chairman: To come back to your three alternatives, it seems to me that they could be viewed as alternatives, but they could also be viewed as complementary.

Mr. Andrew: That is right.

The Chairman: Because you could certainly envisage the possibility of giving the main responsibility to the Secretary of State for the federal involvement in education as well as for cultural affairs, and that would seem to be quite an homogeneous assignment. Then individual things related to the sciences and to research, given your number 2 or 3 there, could be combined, because I could quite easily see the minister responsible for science policy being the chairman of a Cabinet committee. So, I think you have not developed all the possibilities there, and it might be a little misleading to present them as alternatives.

Mr. Andrew: This is exactly why we have made these kinds of recommendations to this committee. And, if I may say so, during your period of office as Secretary of State, the universities of Canada became very much aware of your deep concern and the flexibility of your mind with regard to possible political solutions to this, so this is why we ourselves do not favour any specific solution at this time. We feel that this is really the chamber of sober second thought and, as I have seen this morning, there is a lot of concerned expertise here.

Senator Carter: Is the other group here yet, Mr. Chairman?

The Chairman: No, they have not arrived yet.

Senator Carter: Mr. Andrew, you spoke earlier of centres of excellence. Do you think it should be a part of government policy to develop at least one centre of excellence in each province of Canada?

Mr. Andrew: No, that would not be either good or logical, but let me discuss some of the obvious things. I have already indicated

that in oceanography there are certain provinces that would obviously be concerned in the subject, but how many centres of oceanographic study there should be is, in the last analysis, a political decision. This is where the over-view comes in. International studies is another field which is within the federal jurisdiction because it at least has a responsibility, if not an exclusive responsibility, for international affairs.

It seems to me clear that the universities of British Columbia should be involved in Asian studies. I think we always have to bear in mind here that by and large where there is an adequate need there should be developments in the French language universities as well as the English language universities in major areas of federal concern. For example, at the moment Laval has the only developed institute of bilingualism. I feel it should really get major support to develop that so that we have teaching instruments in French and English that are devised in Canada; so that we have *voix et images du Canada* rather than *voix et images de France*. Actually, the French language in Canada is a North American variant of the French language, and it should be so recognized, and I think its association with North American technology makes it highly desirable. These are all problems central to the French Canadian society which need to be handsomely explored.

Without saying that there should be something in every province, I think that certainly across the country you can find opportunity for real centres of excellence. Not every university can have a centre of excellence in every subject, but in every province there should be a centre of excellence in some particular field.

Senator Carter: That is really what I had in mind, but I would like to pursue that a little further because if you limit your centres of excellence to the large universities in the large centres then what hope is there for the smaller ones?

Mr. Andrew: No, I totally disagree with you there. This is what we mean when we say that national development must include regional development. This applies to the smallish institutions as well as the great institutions. It does not seem necessary to deprive, as I say, the University of Toronto of some of its developed areas of research and study, but if we plan now for the future

we can plan for the support of self-selected, and not Government-selected, areas of excellence in the fields that are of concern to Canadian society.

Senator Carter: Would you say that there is such a thing as uniqueness about certain universities?

Mr. Andrew: Sure.

Senator Carter: Some universities have a unique setting and a unique environment. Should not that uniqueness be developed?

Mr. Andrew: Sure. Let us take a clear example of Queen's. I remember a few years ago talking to Dr. Corry and saying that one would expect that what was originally a Presbyterian foundation would be strong in economics and commerce, and would have some pretensions in philosophy. I was trying to be insulting in a friendly way. He said, "You can repeat that because we had a special lecturer up from New York not long ago and he said that he did not know much about the university." I told him that it was founded as a Presbyterian foundation, to which he replied, "Then you will be good in economics, but no good in sociology." He added, "I had to confess at that time that we had no department of sociology." One of the unique things about Queen's is its strong interest in economics and political science. Actually, it is not surprising that there should have been developed there an institute intergovernmental relations. That institute has not had any real and substantial support yet, but Queen's is uniquely placed to favour that. Carleton has its Institute of Canadian Studies, and that will develop.

The Chairman: And Ottawa is concerned with international co-operation.

Mr. Andrew: Yes. You know, they all sooner or later declare their hand, so to speak, in respect of their uniqueness, and what government has to be able to do is to support that uniqueness. There must be institutional integrity and institutional differentiation in order that they shall not become replaceable parts serving purely provincial needs.

Senator Carter: And you would regard that as a legitimate aim of federal science policy?

Mr. Andrew: Sure.

The Chairman: Provided it is done on a fair basis.

Mr. Andrew: Yes.

The Chairman: Do you think that your association, assisted, of course, by the individual universities, would be in a position to cooperate actively in any kind of a government agency designated for this purpose, so that there would not be too many fights?

Mr. Andrew: As a matter of fact, for years we have been anxious to be propositioned by the federal government in order to find out the extent to which our member institutions would support this kind of viability.

Senator Carter: Could I ask one last question in respect to your correlating committee. I am thinking in terms of centres of excellence. Obviously when you have a province like Ontario, with a huge university like the university of Toronto and a number of smaller universities, there is a special role for a big university in developing and helping the smaller ones to develop. Would your committee embrace that in its role as a correlating committee?

The Chairman: I do not think the Government of Ontario would like that very much.

Mr. Andrew: Yes, we do not have to worry about that because the Committee of Presidents of Ontario Universities are attempting to cope with the rationalization of graduate studies in Ontario.

On the question of smaller universities being helped by the larger, it does not quite work out that way. The smaller universities are entitled to state their ambitions, and if those ambitions fit in with the general work of development in Ontario universities, the two bodies concerned with that are the Committee of Presidents of Ontario universities and the Council on Graduate Studies, and also the advisory committee to the government. At this moment we do not have to consider too much at the national level the internal relationships of universities in the larger provinces; they have mechanisms of their own to relate those things.

Senator Carter: Suppose a university or the government initiated a research project, a new field of research, which is to go on for ten years, which is then broken down into various sub-projects. Some of those could very well be done by some of the smaller universities. Obviously the government cannot give a sub-project of this major project to

each university, but surely there should be a place for the little fellows to fit in. Who would decide that?

Mr. Andrew: This is where what are called the strategic development grants of the granting agencies come in to assist smaller universities to develop a particular research capacity in the field in which they believe, with justification, they have potentialities.

Senator Grosart: With regard to the possible distortion of science effort in the universities through federal project grants, is there any evidence at the moment of major distortion brought about by the specific nature of project grants?

Mr. Andrew: Let us see if we are talking about the same thing. The project grants?

Senator Grosart: The point of my question is this. There is a feeling in the American universities that the military defence project grants in universities tend to distort the academic picture.

The Chairman: You mean when the granting agency takes the initiative and offers a grant for a specific purpose?

Senator Grosart: That is right. That is a project grant. Has it yet brought about a distortion in what might be regarded as the most viable academic mix.

Mr. Andrew: Let me give you an example from personal experience. Professor Forward and I were both at the University of British Columbia years ago when we first got into graduate studies. We got into them in fields like physics, chemistry, zoology, and in his department, metallurgy. We got into those fields because in the early post-war years they were the most competent and capable of developing graduate studies. My own department was English, and, although we had an immensely larger department, our library resources and other things were not at that time up to developing a graduate program. In one sense you could say that the university in that period, in terms of its excellence, was distorted, so to speak, on the side of the sciences.

I would not use the word "distorted" there. I would say that the initiative of the sciences started elevating the standard of the university as a whole, but it became vitally important that the social sciences and humanities be given a chance to catch up. The ones in the

social sciences that did were economics and anthropology. But they had to receive a push, and we had to scramble for the money to find the push, which was not easily given up because the granting agency at that time, the Canada Council, had no money for development grants. The National Research Council was better funded. It all depends on how you look at it. I do not call it distorted in the same sort of way that they are talking about in the United States at the present moment where military research, as some of the major universities have noted, has distorted in growth beyond their control and made them make commitments to people they cannot see their way to finally possibly discharge.

Senator Grosart: A good definition of "distortion".

Senator Yuzyk: On page 10 of your brief I notice you say that the membership of this liaison committee should include, among others, the chairman or executive officers of the various granting agencies, and you list the National Research Council, the Defence Research Board, the Medical Research Council, the Canada Council, the Chairman of the Science Council of Canada, the Director of the Education Support Branch of the Department of the Secretary of State and the Director of the Science Secretariat. Certainly there is a tremendous imbalance here when one considers that the social sciences and humanities have, according to the statements made—and I agree with Father Guindon—been neglected over the years, and something should be done right across the line in the universities to improve the position of the social sciences, humanities and arts. The Canada Council can claim to speak, at least partially, on behalf of many of these disciplines, but if it came to a vote in this committee the natural sciences certainly seem to outweigh the others. How would the AUCC try to fill in this gap, shall we say, of those subjects not represented at all, which should be taken into consideration?

Mr. Andrew: We periodically make representations to the granting agencies about what we feel should be done from the educational point of view.

Senator Yuzyk: To the AUCC?

Mr. Andrew: Yes. You have put your finger on why it should be a correlating committee and not a coordinating committee. A coordinating committee might vote, and I want

the Canada Council in this particular to be free to make its representations to all the other agencies about the adequacy of its grants.

The Chairman: In statistical theory there is quite a distinction between a low degree of correlation and a high degree of correlation.

Senator Yuzyk: And there could be non-correlation.

The Chairman: Would you prefer a high coefficient or a low one?

Mr. Andrew: I am not sufficiently familiar with statistical theory.

Senator Yuzyk: We are interested in having a more effective voice for the social sciences and humanities, and I think a little more attention should be paid to the composition of this liaison committee.

Senator Grosart: Do you think there should be a split between the cultural and arts sciences and the harder sciences along the lines Senator Lamontagne suggested, that perhaps one group should be under the Secretary of State, and that the sciences proper, if I may use that term, should come under...

The Chairman: I did not say that.

Senator Grosart: You suggested that some might come under—

The Chairman: The arts and the cultural affairs.

Senator Grosart: That is what I said. I call them sciences.

The Chairman: I do not include economics in the arts.

Senator Grosart: Although, there is a good deal of fiction there too.

The Chairman: The same thing applies to law.

Reverend Father Guindon: You know what they say about people studying examinations in economics, they keep the same questions, but just change the answers.

Senator Grosart: What about the impact of federal funding in the relationship between the research function and the teaching function? It is sometimes said that in the sciences the tendency is for people to fall in love with research and forget there is a teaching function there. Is there a distortion of this kind?

Mr. Andrew: There is a good deal actually. A lot of their protests, particularly in the undergraduate level is because universities have forgotten that they are concerned with values, as well as knowledge. They object to a curriculum loaded too exclusively on the side of knowledge, in the sense that most of the offerings, according to them, are prerequisites for either professional training or graduate training rather than a relevant curriculum concerned with man's relationship to his fellow man and nature.

The Chairman: Man and his world.

Mr. Andrew: Yes, man and his world. I remember years and years ago when Dr. Schoum, who was then head of the Department of Physics at the University of British Columbia, wanted to engage a very able young scientist who had been highly commended to him. He outlined to this young man his duties, which would be to teach, at that time, three courses, one at the freshman level, one at advanced level and one post-graduate. The young fellow said, "I don't intend to teach any damn freshman," and he was faced with the dilemma of yielding to this fellow or letting him go to another university, to lose some scholarly impetus in his department, or take him and accept his conditions.

I would say it is true that universities have, in fact, been offering courses that are more dictated, by the subject the fellow got his Ph.D. in, than by their exclusive relevance to an undergraduate program designed for undergraduate, general education, as well as their introduction to professional and advance studies. Therefore, the exact mix between knowledge and values has been distorted to some extent. I think it is fair to say, and this is a personal opinion and not the association's opinion, that there has been some distortion there and that we are going to have a correction, because students are now wanting a say, at least in the policies that determine how much you count teaching competence for promotion and tenure, and by and large, I think they should have a say in the policies in this matter, not in terms of individuals.

Senator Carter: There is another factor, too, where the pressure upon the professor in the university, in order to maintain and enhance his reputation, has got to publish a book every once in a while, otherwise he is

not known. He becomes so engrossed in this that he does not have time to bring his lectures up to date and the quality of his teaching suffers considerably.

Mr. Andrew: That is not quite the emphasis. The current emphasis is that there is a revaluation going on in almost every university about the relationship of teaching competence to research competence. This is going on because the students have made it necessary for it to go on. I personally have great respect for this aspect of the student protests.

Senator Grosart: It is not only teaching competence, but teaching willingness. I have sometimes heard my friends, who are teaching in universities, say, "You know, the universities have been very good to me this year; they have cut down my teaching hours by so many hours." It seems to be a status symbol as to how few hours you have to teach.

Mr. Andrew: That was done, of course, to make room for more research productivity. I do not want to seem to be saying that there is not an equal need now as there ever was for research emphasis in universities. I think, however, that there is a need to reappraise the willingness as well as the competence of teachers to teach.

The Chairman: But, do not you think there is a necessity, because of this danger and because there might be very good researchers who are not interested very much in teaching, to keep centres of excellence in research which are not directed or related to teaching?

Mr. Andrew: In this sense we raise another question. Should there be centres of research that are not in universities at all? Of course, there should be. There should be, however, centres of research in universities and the centres of excellence of research in universities should always have some professors who have no teaching load and a few graduate students. This is the point at which they are real centres of excellence and not on the lower levels of the slope. I think, myself, that there are not more than about 5 per cent of the scholarly world who have a big enough research talent to be totally occupied with research for their whole working life; most of us have a few ideas in our lifetime. If we are lucky, we hope to have time to develop these ideas and that time should be available. The majority of people really enjoy exposing their

ideas while they are in the process of clarification, to students. I feel this is the common characteristic of real scholars. They know very well that a sharp student is likely to expose fallacies in their thinking. This is a part of the rough and tumble of academic life most good scholars really enjoy.

Reverend Father Guindon: Here again I will express a little word of caution. This professor, who is just groping for his own ideas in front of his student, is doing as much research as a man who is in a lab. This is one of the problems. We are using the word research in such a restricted sense. If we scratch a little bit we find research is mostly in scientific fields and not quite as much in the social sciences. In teaching, the member of the staff who is preparing a class, is doing as much, but this is not recognized as research, unfortunately. I think there might be a lot of semantics involved here. This is one of our difficulties, that we consider research as being the office of certain groups doing a certain type of work. While research in fact should be a personal involvement of every member of the university and in fact it is, much more than it is recognized.

In ancient times people used to talk about the educated man as a philosopher, which really means an amateur of wisdom. "Wisdom" was the word at that time. Then it became the "artist," but not in the sense we are using that term now. Then it became, in some of the French countries, *l'honnête homme*, the honest man. It was completely different. Now we have come to the scientist who is becoming the big man. I have nothing against science. On the contrary, but I would want that we always keep in mind that the university has to bring together all these sources, and the university has to be given the means to support each and every one of its members in a fair and equitable way.

Since there are some groups which have not been recognized, we are putting a voice for them. Since the different groups more often than not develop individually, without getting together, this interdisciplinary method which is being introduced today is going to salvage the university. Otherwise it is going to break into islands and in fact they are part of an archipelago, they are not just individual islands.

Senator Yuzyk: Is this a general trend in the universities now across the land?

Reverend Father Guidon: One of the frustrations of most of the good teachers who do not happen to be recognized as good researchers is that they are the underdogs in the university. We as university administrators have a problem there. We cannot treat a group of our men, and especially those we feel are doing an excellent job, as teachers, without perhaps publishing a paper. We have to be able to recognize them and give them the support that they require to continue their work.

Senator Grosart: This is where you get your problem of the tendency of funding to emphasize the project—because you can justify the money more easily, whereas if you get into the less visible projects of the humanities it is less spectacular and appears to be less important.

Reverend Father Guindon: Yes.

Senator Grosart: Shakesperean research after about 200 years and 2,000 or 3,000 books, results in this, that the best book written is called "What Happens in Hamlet".

Senator Carter: World wars give a tremendous impetus to the sustaining of research and development. After World War II we saw a slump down and we began to coast along resting on our oars, and during that period the humanities really got more emphasis, probably, than science. After that, about ten or twelve years ago, Sputnik I went up and suddenly we became conscious that we probably are behind in the scientific race in the western world. Then we get this emphasis which is back now on science. We get these cycles which probably level out now, and the trend seems to be more towards the humanities. Would you agree with that?

Reverend Father Guindon: I think I would agree, sir. The very fact that our present situation in the west in certain ways is in a kind of mess, and that there are no many alienated people, should put our minds a big question mark, as to whether we should not put some emphasis on other elements. Perhaps it should not be a deminishing emphasis where it has been laid recently. I think we need that. But I would say that we do this and we do the other one, and perhaps give a fairer proportion of support to the other elements which appear to be really pressing problems.

Senator Grosart: This is why the social scientists elected to call themselves scientists, to get into the club.

The Chairman: I think that is very unfair. I will not answer it now.

Senator Grosart: I am not saying it critically. Perhaps I should have said, "Insist that their status be recognized so that they could get into the club."

The Chairman: Is this because law is not recognized by the Canada Council?

Senator Phillips (Prince): I am intrigued by the statement that universities would participate in studies and changes in Canadian society and economic population migrations, different economic levels, and so on. Does this mean that the Canadian universities and colleges are more interested and more willing to participate in the problems of regional development than they have been in the past?

Mr. Andrew: From my point of view, yes. I would like here to put in a plug for the fact that the biggest amount of money that ever became available to the human and social scientists was distributed in the early days of the Royal Commission on Bilingualism and Biculturalism—which was the first time that research in these fields had ever been undertaken in Canada.

The Chairman: They certainly went at it with a vengeance.

Mr. Andrew: Yes, with a vengeance. It is frightening to think of what would have happened if the Canada Council had not got more money for research in the humanities and social sciences for those who had had their appetites whetted for a few years by this development.

It so happens that our organization this summer hopes to launch a study of Canadian studies in Canadian universities. It will take about a year to complete it. What we are interested in is how interested are the universities in Canada in Canadian literature in two languages.

For instance, when I went to a university, there was no study of Canadian literature: it was all a study of English literature. We are interested in Canadian history in two languages, and with regional development, but basically we are interested in studying how interested the Canadian universities are in the

Canadian content of such subjects as political science, economics, sociology, anthropology, and so on. We want to find out if we get enough well-trained people to respond to the universities' needs to study these subjects, if they feel they should study them—are the source materials available and are the textbooks available?—and to find out if there are some assumptions in contemporary social science, such as the assumption of value free social science—these assumptions having been developed in the great graduate schools of the United States—that have universal validity or whether some of them are products of particular circumstances of American society in the contemporary world?

These subjects need to be studied. Our organization feels that the question of how many Canadians with American degrees, or Americans with American degrees, or British with British degrees, are teaching in our Canadian universities, is a wrong emphasis. What is important is to know how important Canadian universities feel the study of Canadian institutions and Canadian problems is, as an academic discipline. Here again we feel this is an area which has not been adequately supported at the granting level in Canada, possibly because the federal Government has not a posture in this.

Senator Phillips (Prince): I am more interested in the regional development on the economic level. I am thinking of two years ago when the Atlantic Provinces, the four provinces, hired a consultant to deal with a graduate agency in development. They brought in a group or an individual from Scotland. This always struck me as being rather strange, that we could not find someone in Canada qualified to do this. The answer I got from several of the provincial premiers was that our Canadian universities did not train people along this line.

Mr. Andrew: I think, actually, we are coming back to this distortion, if you like to call it that. I think that graduate studies in the sciences in Canada are much more advanced than graduate studies in the social sciences and humanities. We feel that this is a shame, that this cannot and should not prevail, but that, as a consequence, they have not turned out enough people to staff our universities in these fields with people who have been trained in, so to speak, the Canadian aspects of their disciplines. Therefore, there is a shortage of people for this kind of call.

For example, I think Canadian economic history, really, is a fascinating field, but it is not a highly developed field yet. It is not highly enough developed to serve the Canadian society.

Mr. Waines is an economist. Perhaps he would like to comment on that.

Mr. W. Waines, Associate Executive Director, Association of Universities and Colleges of Canada: I think on the last point you have made, one of the important points in the trends in economics is towards mathematics, econometrics and that sort of thing. We find economic historians concerning themselves primarily with the quantitative economic history. This is, if you like, in my view, and I am trained in the traditional rather than the modern theory, the fad in economics these days.

Senator Yuzyk: This is a question of individual preference.

The Chairman: This committee has even discovered that the Bank of Canada has gone "go-go".

Mr. Waines: Of course, all the institutes that are in research in the economic field have gone modern.

Senator Grosart: You have to be a mathematician to be an economist these days.

Mr. Waines: This has sort of distorted the training and research development in economics to the disadvantage of our whole understanding of our economy.

Senator Yuzyk: But the universities are conscious of this and are trying to rectify it, are they not?

Mr. Andrew: Well, you run into problems there. Once the majority in a department gets committed to model building, the tendency is to recruit more of the same. Some day I think we will rediscover that there is a thing called political economy that was abandoned 20 years ago.

Senator Grosart: Then again you call it a "model" to get into the science club, but when you ask to see the model it is just some more pieces of paper.

Mr. Waines: Even the linguists are doing this.

Senator Grosart: In order to get into the club you say that you have to have an econometric model.

Mr. Andrew: This is why this Senate committee is performing an important function. It is airing a whole lot of things that have needed airing in the academic community. Its relationship to federal and provincial authorities and federal purposes in research is important. I hope you gentlemen are conscious of having as high a purpose as we think you have and as good an impact.

Senator Grosart: Father Guindon, when a research project is offered to an individual in the teaching staff of the university, is the management, if I may use that word, of the university consulted? Furthermore, does the management of the university have any veto on the undertaking by that individual of what may be an extramural activity.

Reverend Father Guindon: In many instances, sir, the grants are given to the individual and the institution as such is not consulted. However, the individual will talk to the head of his department and to his dean.

So far as the veto powers go, almost the only veto we can exercise is when it comes to a project which would require erecting another building or getting facilities that are not provided in the grant and which the university cannot provide.

Senator Grosart: You d'ont have any NHL contracts.

Reverend Father Guindon: Not yet.

Mr. Andrew: Nor do we desire them.

Senator Grosart: It seems extraordinary that any department or agency of any government would deal directly with a member of a university staff without consulting the university first. Is this a problem, so far as you are concerned?

Reverend Father Guindon: It could develop into a problem, if it went much further than it has up to now. We have more or less managed. But I must say that we have managed until now because we have had to—not take away but not give to other areas of the university, having to live within a limited amount of money. If the project was going to go, we had to find the money.

Senator Grosart: This comes into the problem of total funding where, if you were

consulted, you might say, "Well, no, unless you are prepared to pay the whole shot."

Mr. Andrew: It also comes into the interrelationship between the scholar and the institution, because scholars are a mobile group. They can take their grants and move; they can take up their beds and walk. Universities sometimes find themselves left with equipment that is no longer useful to a particular person, but, on the other hand, it would be wrong, if the institutions were the arbiters of scholarly activity. So our association is terribly concerned to relate the institutional commitment to the scholarly involvement. So we do not want to be the final arbiters on anything, irrespective of scholars.

On the other hand, we feel that unless the scholar gets the support, the commitment of his university, he cannot really build a monument.

The Chairman: I don't know if we should establish a precedent here, but one of our visitors desires to ask a question. This has not been done before.

Dr. J. J. Keen, Chairman, Geology Department, Dalhousie University: Mr. Chairman, it is just a matter of correction. I believe the two witnesses are incorrect in stating that there is no veto power at the universities over grants to individuals. There is, in fact, a direct veto power in the matter of NRC grants. The form of appropriation has to have the signature of the dean and he can say no.

Mr. Andrew: I would like to correct the corrector. The Canada Council makes it very clear that when a signature goes on it, this is merely a signature that certifies that the university has been informed, and both the university, the Council and the individual deny categorically that this is any veto power.

Senator Yuzyk: If a group of university professors takes on a project from the Canada Council, for example, is this not administered by the university as such and at that time does the university not have some say in the development of that project or in its completion?

Reverend Father Guindon: The grants are given at times to the individual and at times to the university for administration depending on which appears to be the more suitable. In fact in the research requests the researcher has established this own budget and the only administration that the university does is to

see that the monies, when the grant is given to the university, are spent for the indicated items on the budget. Now some of the researchers can ask to have the funds switched from one item to another and when this is approved, the university administers this. It is not an auditive function that the university performs but an administrative one only.

Senator Yuzyk: But what if the university officials or somebody in the administration finds out that the money is not used properly, or that the project is not developing according to the plans laid down. Can you then stop this project?

Reverend Father Guindon: I think it is for the researcher to present his report to the granting body and it is for the granting body to make the decision.

Senator Yuzyk: Therefore the university plays no part in it.

Reverend Father Guindon: We have to be very clear about this. University administrators are not *per se* in the position to judge the academic purpose of a research grant as such, and therefore it would be presumptuous for them to comment on how a thing is proceeding. That is between the grantee and the grantor. But the researcher is supposed to submit reports and those reports have to be adequate.

The Chairman: We as a committee have gone to the United States recently, to Washington and Boston and we have also visited the M.I.T. and Harvard. We were very much impressed by the great mobility of the broad scientific community in the United States. Now I do not know if we saw a non-typical

example, but most of the people that we met had been, if they were not in a university, working for government or industry before. I do not think we have the same kind of mobility here in Canada and I think it would be highly desirable.

Mr. Andrew: There is a good deal of mobility within universities now, but actually you have raised indirectly another important matter and that is the adequacy of research in the industrial sector. Of course many of our industries are branch plants of industries in the United States, and since most of their research is done in the United States this limits the amount of mobility as between industry and university. There are many reasons for this. I feel there could also be more between government and universities. I know some departments of government are concerned about the interchange but I myself think it is not a bad experience for people to have the opportunity to serve in both capacities from time to time.

The Chairman: I am sure that I am speaking on behalf of the members of the committee when I thank you most sincerely for spending all this time with us this morning. We are a little frustrated in that you have not been able to present your views to the board before appearing here today and giving us the benefit of the result. I realize this is probably our own fault because of the way we have worked out the schedule of our hearings. We certainly hope we will get a copy of the brief that will eventually be adopted by your board in relation to the Macdonald study.

Again, gentlemen, I want to thank you very much indeed, for being with us.

The committee adjourned.

APPENDIX 60

A Brief
Submitted to
the Study Group
Sponsored by the Science Council of Canada and the Canada Council
on
The Support of Research in
the Universities
by the
Association of Universities and
Colleges of Canada

April 30, 1968.

Institutions of higher education have two primary functions: teaching and research. These functions are concerned with knowledge for its own sake, but they are also concerned with the scientific, technological, economic, social, and cultural development of all the communities which they serve, whether local, provincial, regional, national or international.

Canadian universities, conscious of these teaching and research responsibilities, are trying to find ways by which they can relate to all the authorities which have responsibilities for economic, social and cultural development and for international cooperation. They are concerned especially about the intimate relationship between expensive research and high-level manpower training. In addition, the universities are conscious of their responsibility for developing international studies, for maintaining contact with universities throughout the world, and also for assisting in programmes of aid to developing countries.

Canadian universities and colleges are fully aware that in order to achieve these goals they must hope for close cooperation between appropriate provincial and federal authorities.

Most of the universities' problems stem from the universal dimensions of education. They are tied in with the explosive growth of knowledge, and the extraordinary multiplication of fields of specialization. Adequate planning in this context requires, therefore, Canada-wide consultation between representatives of the provinces, the federal government and its agencies, and the university community, if the development plans of the various political jurisdictions are to be served, and if the universities' obligations to the world of learning are to be recognized, without unnecessary duplication, overlapping, and wastage of resources.

This Canada-wide consultation is also urgently needed to cope with a range of social and economic problems which the universities may help solve:

- changes in Canadian society and its economy, population migrations, differences of economic levels causing serious drainages of manpower and resources from one region to another;
- international responsibilities, e.g. the training of specialists in African, Asian, and other regional studies which need not be undertaken by all institutions;
- the special requirements of professional and quasi-professional bodies and of various groups concerned with higher education, e.g. medical and health associations, continuing education organizations, etc.
- students' role in university affairs and the portability of student benefits across provincial boundaries;
- formula financing and other financial aspects of higher education.

Cooperation is equally needed to deal adequately with some or all of the following areas of specific concern.

1. Matters which fall within provincial jurisdiction but which have Canada-wide implications such as urban and rural development; health and welfare; forestry, including fire and disease control.
2. Problems of economic, social and cultural development, which may fall within provincial jurisdiction with Canada-wide implications or within concurrent or divided jurisdictions: productivity and economic growth; natural

resources, fisheries, inland waters, oceanography, conservation and pollution problems, etc.; communication, climate control projects, nuclear energy facilities; northern studies; upper atmosphere and space studies; regional computer centres, etc.

3. Matters which fall within federal jurisdiction: defence, external affairs, inter-cultural relations in Canadian society, including bilingualism; transportation on an interprovincial and interregional basis.

4. Matters which require cooperation interprovincially between universities and provincial governments, such as the exchange of information, the use of new media of communication, the development of compatible equipment to permit exchanges; cooperative production and use of recorded material; library development and cooperation; central information retrieval systems. The urgent need for rapidly available statistical data regarding students, staff and finance and other aspects of higher education cannot be stressed too much.

It should first be noted how much of the machinery for effective university-provincial or university-regional cooperation has been developed in the past few years.

Provincial, or regional, "associations" of universities now exist in the Atlantic provinces, Quebec, Ontario, and the western provinces. In addition, in a number of provinces, the government departmental arrangements for considering higher educational needs and problems have been reviewed and revised. And finally in Nova Scotia, New Brunswick, Ontario, Manitoba, Alberta and British Columbia, agencies have been brought into being, intermediate between government and universities, to consider university and pro-

vincial needs for higher educational services and make appropriate recommendations to government. Not all these agencies have the same responsibilities in detail but the patterns of responsibility are similar. In short, it can now be said that great strides have been made in developing provincial (and to a minor extent, regional) systems of higher education to meet some of the most pressing and particular needs of the complex Canadian federal structure.

The purposes of these basically provincial systems are to:

- 1) assist the universities in planning to meet provincial needs for higher learning, research, and high level manpower training;
- 2) to rationalize university offerings and areas of specialization, avoiding unnecessary duplication, and making the best use of available resources.

It would be premature to report enormous progress in achieving these objectives. It would seem to be apparent to all concerned that the objectives cannot be pursued successfully in a provincial context alone, but that in a country like Canada, they have to be pursued concurrently, in provincial, regional, federal and national contexts.

National objectives are not by any means the same as federal objectives, nor are they the same as provincial objectives because they embrace both the federal and provincial responsibilities as well as those which universities have to the world of learning.

The Centennial Conference of the AUCC recorded in the form of the following resolutions their concern for research development in Canadian universities.

RESEARCH PRIORITIES

RESOLVED THAT the AUCC continue to encourage its members to pay primary attention to the development of research policies

which relate to the universities' responsibilities for teaching and enlarging the body of knowledge, but at the same time to remember that emphasis should also be placed on mission-oriented research projects which are in the national interest.

GOVERNMENT RESEARCH LABORATORIES

RESOLVED THAT the AUCC urge governments to adopt the policy of establishing government research laboratories on university campuses, and in such circumstances, the university be given adequate means to strengthen the related departments.

PRODUCTIVITY AND RESEARCH

RESOLVED THAT the AUCC encourage increased support for applied research in universities as a means of raising national productivity.

RESEARCH IN THE BIOLOGICAL SCIENCES

RESOLVED THAT the AUCC acquaint the government of Canada and the general public of the vast increase in the research requirements of the biological sciences that will take place during the next decade; the AUCC believes that it is in the national interest that the universities' facilities be increasingly employed and developed with public funds to carry on the greater part of this expanded research activity.

RESEARCH SUPPORT FOR SMALL UNIVERSITIES

RESOLVED THAT the AUCC recommend that granting agencies support research in small universities sufficiently to provide on a continuing basis technical assistants and services necessary for efficient research.

INSTITUTIONAL GRANTS

RESOLVED THAT the AUCC while encouraging agencies granting

research funds to continue with their traditional grants to individuals, nevertheless urges that such agencies award grants to institutions of higher learning in order to enable them to initiate and maintain significant research projects, particularly those in the national interest.

ROLE OF UNIVERSITIES

RESOLVED THAT the AUCC urge its members to identify and interpret their distinctive roles in education, research and community service and to cooperate with other institutions of higher education and governmental agencies thereby ensuring a coherent effort, serving the economic, social and cultural development of provincial and national communities, employing scarce resources most effectively.

SOCIAL SCIENCE RESEARCH AGENCY

RESOLVED THAT the AUCC, in close cooperation with the Social Science Research Council of Canada and other appropriate learned societies, and with the assistance of the Canada Council, establish a Committee to study the feasibility of the creation of an inter-university agency which would have the following functions:

- a) the organization of a social science data-bank,
- b) the provision of appropriate services to facilitate survey research.

ASSISTANCE FOR INTERNATIONAL STUDIES

RESOLVED THAT the AUCC recommend to appropriate agencies that assistance be given to Canadian universities and colleges in their efforts to broaden and deepen the international studies content of undergraduate and graduate teaching programs.

INTERNATIONAL STUDIES GRANT

RESOLVED THAT the AUCC recommend to appropriate agencies the establishment of generous programs of awards for Canadian scholars in the field of international studies.

RESOLUTION ON CANADIAN UNITY

RESOLVED THAT in order to ensure that the intellectual resources of Canada, to the fullest extent possible, may be devoted to the needs of Canadian unity and individual human well-being, the AUCC shall seek to encourage research, teaching, publications and student-teacher exchanges, all with a view to achieving a deeper awareness and acceptance of Canada's two official languages and cultures and those fundamental values held in common by all Canadians.

The first essential element in developing a strong Canada-wide system of higher education is to ensure that adequate machinery for provincial consultation for provincial development exists and works satisfactorily.

It would appear that the machinery (as indicated above) is being developed in most provinces and in some it is already being tested with respect to rationalizing the requirements for professional and graduate studies.

Less attention has been given so far to the relationships between the universities within a province and the research needs of the province as a whole, though it is clear that the universities are expected to make a major contribution to the solution of the scientific, technological, economic and social problems of the province. That is to say, the universities are expected to make their appropriate contributions to applied as well as to basic research. Universities must be concerned with the applied problems of engineering, education, the social sciences and humanities, provided that these problems possess the quality which calls for theoretical understanding as well as technical knowledge. A good deal of care will have to go into defining what is appropriate in such fields.

However, it is recognized by most universities, provincial grants commissions, and provincial higher educational authorities that efficient rationalization and planning at the provincial level requires some knowledge and consideration of regional and federal government planning, particularly in the fields of research and high level manpower training.

The need for planning on a wider than provincial basis is reflected regionally in the existence of the Association of Atlantic Universities, the Interprovincial Committee for University Rationalization (for the prairie provinces), and the Commission inter-universitaire des cours télévisés et radiodiffusés, and on a Canada-wide basis by the establishment of the Council of Ministers of Education. The Association of Universities and Colleges of Canada and its associate members such as the Association of Canadian Medical Colleges, the Canadian Association of Graduate Schools, the Canadian Association of College and University Libraries, etc., are concerned with ways and means by which the universities and colleges of Canada can serve both provincial and federal interests;— and through l'Association des universités partiellement ou entièrement de langue française, the Association of Commonwealth Universities and the International Association of Universities, the universities of Canada express their interest in matters of international concern.

The last formally stated federal position (presented by the Prime Minister in his address of October 1966) affirmed a federal responsibility for research, cultural development, equality of educational opportunity, and certain kinds of manpower training or retraining.

Recent discussions of federal and provincial responsibilities have made it evident that no clear line can be drawn between education and culture. Most educators would agree that all research (whether in the physical and biological sciences, the social sciences or the humanities) which contributes to the advancement of learning is an aspect of cultural development.

If the federal government is to continue to be involved in research in its own laboratories and to support research in the universities for national purposes it is essential that the federal government the provincial authorities and the universities should be able to keep under review the relationships between provincial needs and programs, federal needs and programs, and the resources available to the universities to carry out their part of national programs.

For the past two years, the AUCC has taken an initiative in convening a meeting to discuss the development of a consultative mechanism to relate provincial, federal and national concerns in research and the high level manpower training which normally accompanies it. Those attending have comprised representatives of provincial departments of education or university affairs, the executive officers of provincial or national associations of universities and the executive officers of provincial advisory committees or commissions on higher education. At the last meeting on April 17, 1968, Dr. W. Swift was requested, on behalf of the representatives present, to explore the holding of a similar meeting in 1969; to enquire into matters that might be profitably discussed at such a meeting; to enquire into the appropriate bodies or agencies to be represented at such a meeting; and to decide upon the appropriate time to hold such a meeting.

As has been noted, the universities of Canada, through their provincial, regional, and national organizations, have begun to appraise and review their research and graduate training structures with a view to the selection and development of areas of special strength. In Ontario, for example, the Ontario Council on Graduate Studies has begun to devise appropriate mechanisms for the selective development of graduate and research strength in that province.

More recently, an advisory committee was formed by the AUCC and the federal Department of Energy, Mines and Resources to assist and advise on the development of inland waters research throughout Canada.

A similar relationship has been developed between the AUCC and the Fisheries Research Board.

Most recently, the AUCC has contracted with the External Aid Office to undertake a study of Canadian university resources for cooperation in higher education with developing countries.

In addition to encouraging the development of the self-selective and cooperative mechanisms described in the preceding paragraphs, the AUCC feels that it is desirable to have an organism within the federal government which will allow the universities to have access to a single body representing the major federal research granting agencies and advisory bodies. Such a mechanism would facilitate the development of policies with respect to granting research funds to universities, with the understanding and support of all the federal agencies involved.

The AUCC recommends that this mechanism should be developed in the form of a liaison committee which would be advisory to a Minister of the Crown. It suggests that the chairman of the committee might be either the Secretary of the Cabinet or the Deputy of the Minister to whom the committee reports. It suggests further that the secretary of the committee might be the Director of the Education Support Branch of the Department of the Secretary of State. The committee membership should include, among others, the chairman or executive officers of the various granting agencies: the National Research Council, the Defence Research Board, the Medical Research Council, the Canada Council, the Chairman of the Science Council of Canada, the Director of the Education Support Branch of the Department of the Secretary of State, and the Director of the Science Secretariat.

The primary purpose of this committee should be to help the granting agencies and related advisory bodies to develop policies, whether integrated or diversified, relating to the support of research in the universities of Canada. In particular, we would suggest that the following, among other matters, should fall within the terms of reference of the committee:

1. To consider and from time to time advise the Minister with respect to the annual rate of increase for research grants and whether or not this should be the same for all granting agencies.
2. To recommend to government, policies with respect to overhead on research grants and how such overhead should be determined for the various fields of research.
3. To recommend to government which agencies should receive appropriations for research support to each academic discipline, sub-discipline, and to the new developing interfaces between disciplines.
4. To recommend to government the appropriate levels for support of research in those areas which encompass a wide range of scientific fields and cross the boundaries of the terms of reference of a number of granting agencies. Examples of such areas particularly relevant to Canadian interest might include: communications, transportation, northern studies, etc.
5. To discuss the grant-giving mechanisms used by the grant-giving agencies.

It should be noted here that the AUCC has been particularly concerned for a long time that the federal granting agencies should defray the overhead costs of research conducted in the universities with the support of federal grants.

In September 1965, in a memorandum to Government we endorsed the recommendations of the Bladen Commission that all federal research grants should carry with them a 30% supplement as an unconditional grant to the university.

On May 30, 1966, in a letter to the Prime Minister of Canada (appendix "A") we drew special attention to the Bladen recommendation that

research grants to universities should carry with them a 30% supplement for overhead and urged "that this be accepted as an integral part of the federal responsibility for research activity".

On February 9, 1967, in a further letter to the Prime Minister of Canada (appendix "B"), we again urged the need for action in the following terms:

"It is apparent to us that if the Federal Government intends to continue to provide research grants through the National Research Council, the Medical Research Council, the Canada Council, and other federal agencies direct to the universities, it must also make provision for the indirect costs of that research if it wants to avoid claims by the provinces that the indirect costs of such research grants constitute a charge against university budgets and consequently against provincial revenues over which they have no control.

It has now become urgently necessary to reassure the provinces on this matter, and, with this in mind, the AUCC is particularly concerned to obtain a concerted government research policy. The National Research Council, the Medical Research Council, and the Canada Council have all been considering the matter as has also, we understand, the Science Council, but it is difficult to get a concerted policy as the Councils concerned report to three different ministers. It is not yet clear whose responsibility it is to concert government policy in research matters."

Further, in a letter to Dr. Solandt, dated May 25, 1967 (copies to Dr. Roger Gaudry and Dr. J.B. Macdonald) the AUCC urged the need for an interim report by the Macdonald Study group on this important matter (appendix "C").

Finally, the following resolution was passed at the annual meeting of the AUCC in November 1967.

FULL SUPPORTING COSTS OF RESEARCH

RESOLVED THAT the AUCC urge agencies which provide research funds to universities to include in their grants the full supporting costs of the research.

The interest of the AUCC in this matter of overhead has been long sustained and remains unabated, although it recognizes the need to deal with the subject in somewhat altered terms in the light of the new fiscal arrangements.

The AUCC does not recommend any changes at this time in the existing granting agencies or in the advisory bodies. It has chosen to concentrate on recommending the establishment of the above-mentioned committee to advise the government regarding the relative advantages of integrated or variant policies with respect to the various fields of knowledge and the different granting agencies.

If some developed policies emerge from the recommendations of such a committee, the universities of Canada will be in a better position to order their relationships with the individual departments of government which also supply money for research or training purposes.

The existence of such a committee would enable the federal government to cooperate more effectively with the provinces, with the Council of Minister of Education, and with the universities. It would further aid the universities to self-select areas of particular research strength to meet provincial, federal, and national needs, without excessive duplication, and with due regard to the contribution which the universities and colleges of Canada ought to make to the world of learning.



First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA
PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., *Chairman*
The Honourable DONALD CAMERON, *Vice-Chairman*

No. 45

TUESDAY, MAY 27th, 1969

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WITNESSES:

Dr. J. M. R. Beveridge, President (Academic), Acadia University, Wolfville, N.S.;
Dr. G. F. O. Langstroth, Acting Dean, Faculty of Graduate Studies, Dalhousie
University, Halifax, N.S.; Dr. M. J. Keen, Chairman, Department of Geology,
Dalhousie University, Halifax, N.S.; Sister Mary Evelyn Fitzgerald, Ph.D.,
Chairman, Department of Chemistry, Mount St. Vincent University, Halifax,
N.S.; Dr. W. A. Bridgeo, Dean of Science, St. Mary's University, Halifax, N.S.;
Rev. Dr. E. M. Clarke, Head, Department of Physics, St. Francis Xavier Uni-
versity, Antigonish, N.S.; Dr. G. W. Holbrook, President, Nova Scotia Technical
College, Halifax, N.S.; Dr. D. B. Burt, Associate Professor, Department of
Biology, University of New Brunswick, Fredericton, N.B.; Dr. Jean-Rene
Longval, Director, Department of Engineering, University of Moncton, Moncton,
N.B.; Dr. L. Loucks, Assistant Professor, Department of Chemistry, Prince of
Wales College, Charlottetown, P.E.I.; Dr. M. Laird, Head, Department of
Biology, Memorial University of Newfoundland, St. John's, Newfoundland; Dr.
I. Unger, Assistant Professor, Department of Chemistry, University of New
Brunswick, Fredericton, N.B.

APPENDICES:

- 61.—Brief submitted by Faculty of Science, St. Francis Xavier University, Anti-
gonish, N.S.
- 62.—Brief submitted by Memorial University of Newfoundland, St. John's New-
foundland.
- 63.—Brief submitted by the Science Faculty, St. Mary's University, Halifax, N.S.
- 64.—Brief submitted by Dalhousie University, Halifax, N.S.
- 65.—Brief submitted by Acadia University, Wolfville, N.S.
- 66.—Brief submitted by Faculty of Science, University of New Brunswick, Frede-
ricton, N.B.

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*

The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (<i>Carleton</i>)
Blois	Hays	Phillips (<i>Prince</i>)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie,
Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

(a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;

(b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;

(c) federal assistance to research and development carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and

(d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

“With leave of the Senate

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.”

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

TUESDAY, May 27, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3.00 p.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Blois, Bourget, Carter, Grosart, Haig, Kinnear, Lang, Phillips (*Prince*), Robichaud, Sullivan, and Yuzyk—13.

Present but not of the Committee: The Honourable Senator Smith (*Queens-Shelburne*)—1.

In attendance: Philip J. Pocock, Director of Research (*Physical Science*); Gilles Paquet, Director of Research (*Human Science*)

The following witnesses were heard:

Dr. J. M. R. Beveridge, President (Academic), Acadia University, Wolfville, N.S.; Dr. G. F. O. Langstroth, Acting Dean, Faculty of Graduate Studies, Dalhousie University, Halifax, N.S.; Dr. M. J. Keen, Chairman, Department of Geology, Dalhousie University, Halifax, N.S.; Sister Mary Evelyn Fitzgerald, Ph.D., Chairman, Department of Chemistry, Mount St. Vincent University, Halifax, N.S.; Dr. W. A. Bridgeo, Dean of Science, St. Mary's University, Halifax, N.S.; Rev. Dr. E. M. Clarke, Head, Department of Physics, St. Francis Xavier University, Antigonish, N.S.; Dr. G. W. Holbrook, President, Nova Scotia Technical College, Halifax, N.S.; Dr. D. B. Burt, Associate Professor, Department of Biology, University of New Brunswick, Fredericton, N.B.; Dr. Jean-Rene Longval, Director, Department of Engineering, University of Moncton, Moncton, N.B.; Dr. L. Loucks, Assistant Professor, Department of Chemistry, Prince of Wales College, Charlottetown, P.E.I.; Dr. M. Laird, Head, Department of Biology, Memorial University of Newfoundland, St. John's Newfoundland; Dr. I. Unger, Assistant Professor, Department of Chemistry, University of New Brunswick, Fredericton, N.B.

(*A curriculum vitae of each witness follows these Minutes*)

The following are printed as Appendices:

- 61—Brief submitted by Faculty of Science, St. Francis Xavier University, Antigonish, N.S.
- 62—Brief submitted by Memorial University of Newfoundland, St. John's, Newfoundland.
- 63—Brief submitted by the Science Faculty, St. Mary's University, Halifax, N.S.
- 64—Brief submitted by Dalhousie University, Halifax, N.S.
- 65—Brief submitted by Acadia University, Wolfville, N.S.

66—Brief submitted by Faculty of Science, The University of New Brunswick, Fredericton, N.B.

At 5.55 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee

CURRICULUM VITAE

Beveridge, James MacDonald Richardson. Born: 17 August, 1912, Dunfermline, Scotland. Married: Jean Frances Eaton, 1940; 2 daughters and 5 sons. Degrees: B.Sc. (1937) Acadia University; Ph.D. (1940) Toronto; M.D. (1950) Univ. of Western Ontario; D.Sc. (1962) (hon.) Acadia University; LL.D. (1966) (hon.) Mount Allison. Occupations: Research Assistant, Banting Institute, University of Toronto, 1940-44; lecturer, University of Western Ontario, 1946-50; Craine professor biochemistry, head department, Queen's University 1950-64; chairman, board of graduate studies, 1960-63; dean, graduate studies, 1963-64; 1964-present, President, Acadia University. Principal Fellowships and Memberships: Fellow, Royal Society of Canada; Fellow, Chemical Institute of Canada; Member, American Institute of Nutrition; Member, Canadian Biochemical Society; Member, Canadian Physiological Society (sec. 1953-56); Member, Nutrition Society of Canada (pres. 1965); Director, Canadian Broadcasting Corporation (1966-68); Member, Alpha Omega Alpha (Honor Medical Society); Member, Science Council of Canada (1968-). Publications: Has published almost 100 papers in the fields of protein analysis, lipotropic factors, and fat metabolism.

Bridgeo, Dr. W. A.—Dr. W. A. Bridgeo is a native of Saint John, New Brunswick where he received his early education. He graduated from Saint Francis Xavier University in 1948 with a Bachelor of Science degree and he joined the Nova Scotia Research Foundation as an Analytical Chemist. From 1949 to 1952, he pursued graduate studies in Organic Chemistry and received his Ph.D. from Ottawa University. After a further year of study at Notre Dame University, he returned to the Nova Scotia Research Foundation to develop its technical information service to industry and carry out a wide range of projects and duties. This activity grew into the formation of the Technical Services Division in 1958 which he headed until January, 1962 at which time he went on leave of absence for eighteen months to work on a fuel cell research project at New York State University College of Ceramics, Alfred, New York. On returning to Halifax in 1963, he resumed his duties with the Nova Scotia Research Foundation and also was appointed as an Associate Professor of Chemistry at Saint Mary's University. In 1965 he became Director of the Chemistry Division of the Nova Scotia Research Foundation and in 1967 was appointed Dean of Science at Saint Mary's University. Dr. Bridgeo is Chairman of the Atlantic Section of the Chemical Institute of Canada and holds memberships in the American Association for the Advancement of Science, the Nova Scotia Institute of Science, the Halifax Board of Trade, Saint Thomas Aquinas Men's Association and the Waegwoltic Club.

Burt, Michael David Brunskill: Date and Place of Birth: January 19, 1938; Colombo, Ceylon; Marital Status: Married, with four children; Position: Associate Professor; Department: Biology; Institution: University of New Brunswick; Degrees and Qualifications: B.Sc. (First Class Honours) in Zoology with Para-

sitology as special subject. University of St. Andrews, Scotland, 1961; Ph.D. for a thesis entitled "Parasitological Studies"; University of St. Andrews, Scotland, 1967; F.L.S. elected in 1966. Academic and Research Experience: 1956-1957 University of St. Andrews, Scotland; 1957-1958 Union College, Schenectady, N.Y., U.S.A., on a C. Vreeder Scholarship; 1958-1961 University of St. Andrews, Scotland; 1961-1962 Assistant Professor, Department of Biology, University of New Brunswick; 1962 (summer) Research Assistant to Dr. T. W. M. Cameron, Institute of Parasitology, Macdonald College, P.Q.; 1962-1964 Research student and senior demonstrator, University of St. Andrews, Scotland; 1963 (summer) British Council Research Scholarship for study at the Université de Neuchâtel, Switzerland, under the direction of Professor J. G. Baer; 1964-1968 Assistant Professor, Department of Biology, University of New Brunswick; 1968-present, Associate Professor, Department of Biology, University of New Brunswick. Number of Publications: Nine, on Parasitology.

Clark, Ernest M., Chairman Department of Physics, St. Francis Xavier University. He was born in Saint John, N.B. on May 12, 1911. He received the B.Sc. with Engineering from St. Francis Xavier University in 1932, and the D.Sc. from Laval University in 1956. His doctoral thesis was on "The Measurement of Ionization Potentials with a Mass Spectrometer" and he has published ten papers in this field. He first taught at St. Patrick's College, Ottawa, and since 1936 has been attached to St. Francis Xavier University, being ordained to the Roman Catholic Priesthood in 1942. He has been a consultant to the Gulf General Atomic Laboratory in San Diego, California in the field of electron impact phenomena, and to the Nova Scotia Department of Mines and the Nova Scotia Research Foundation in the field of non-destructive testing.

Fitzgerald, Sister Mary Evelyn: Chairman, Department of Chemistry, Mount Saint Vincent University, Halifax, Nova Scotia. Born in Calgary, Alberta, August 20, 1911. Attended elementary and secondary schools in Swift Current, Sask., Medicine Hat, Alberta, and Edmonton, Alberta. Worked for two years in the Department of Education, Edmonton. Entered the congregation of the Sisters of Charity, Halifax, in 1930. B.A., Dalhousie University, 1935; M.A. (Chemistry), University of Toronto, 1937; Ph.D., Catholic University of America, Washington, D.C., 1951. Taught high school in Nova Scotia and New York. Currently teaching (1940-) at Mount St. Vincent University.

Holbrook, George William: Date of birth: 16 December, 1917; Marital status: Married; Degrees Obtained: B.Sc. 1938, London University; M.Sc. 1949, Queen's University; Ph.D. 1956, London University; Teaching Experience: 1941-42, 151 OCTU as Radio Instructor, Aldershot, England; 1948-50, Chief Instructor, Royal Canadian School of Signals, Vimy Barracks, Kingston, Ontario; 1950-58, Head of Dept. of Electrical Engineering, RMC, Kingston, Ontario; 1958-61, Chairman, Division of Engineering, RMC, Kingston, Ontario; 1961, President, N.S. Technical College, Halifax, N.S.; Professional Experience: 1938-39, Standard Telephones and Cables, London, England; 1939-50, Royal Corps of Signals in ranks of Lieutenant to Lt.Col; 1950-61, RMC Department of Electrical Engineering, Kingston, Ontario; 1961, President, N.S. Technical College; Memberships in Professional Societies: Professional Engineers, Province of

Nova Scotia; Associate Member of Institution of Electrical Engineering; Member Engineering Institute of Canada; Member of I.E.E.E.; Honours and Awards: Ross Medal of Engineering Institute of Canada (awarded 1956).

Keen, M. J. Educated at Oxford University (B.A., Geology, 1957) and Cambridge University (Ph.D., Geophysics, 1961); Assistant Professor, Institute of Oceanography, Dalhousie University, 1961-1964; Associate Professor, 1964-1969; Professor and Chairman, Department of Geology, Dalhousie University, 1969-. Interested in marine geology and marine geophysics. Author of a number of scientific papers and one book, "Introduction to Marine Geology". Age 34.

Laird, Marshall. Born: Wellington, New Zealand, 1923. Married: 1949 (two daughters—one born in Singapore, 1955; one born in Montreal, 1958). Degrees: (All University of New Zealand); M.Sc. (Hons.), 1947; Ph.D., 1949; D.Sc., 1954. Distinctions: Hamilton Prize, Royal Society of New Zealand, 1951; Research Medal, New Zealand Association of Science, 1952; Fellow, American Association for the Advancement of Science; Honorary Member, Royal Society of New Zealand, 1966. Positions held: Entomologist, Royal New Zealand Air Force, World War II Service, and subsequent research assignments until 1954 (rank of Squadron Leader); Lecturer, Department of Parasitology, University of Malaya (now University of Singapore), 1954-57; Assistant Professor, Institute of Parasitology, McGill University, 1957-58, and Associate Professor, 1958-61; Chief, Environmental Biology Unit, World Health Organization, Geneva, 1961-67; Professor and Head of Biology, Memorial University of Newfoundland, 1967. Committee Memberships: Member, Expert Advisory Panel on Insecticides, World Health Organization, 1953-61, (Chairman, 1960); Currently, Member of Canadian International Biological Programme Subcommittee on Marine Productivity, etc. Interests: Protozoology, especially blood parasites of birds (the Department of Biology of Memorial University was recently designated as the World Health Organization's International Reference Centre on Avian Malaria Parasites); Ecological aspects of public health entomology, including mosquito larval habitat ecology, biological control, and insect control in relation to international transportation; Parasitology in marine and other aquatic environments.

Langstroth, George Forbes Otty. Date of Birth: July 13, 1936. Present Address: 2-304 Bedford Highway, Rockingham, Halifax, N.S. Marital status: Married, 2 children. 1953-57, B.Sc. (Alberta). Awards: University of Alberta Honour Prize; University of Alberta First Class Standing Prize; University of Alberta President's Scholarship; Seismic Service Supply Bursary; 1957-59, M.Sc. (Dalhousie); Awards: James Gordon MacGregor Teaching Fellowship N.R.C. Studentship; 1959-62, Ph.D. (London); Awards: 1851 Exhibition Overseas Scholarship; N.R.C. Special Scholarship; 1962-63, Research Associate, Department of Physics, Dalhousie University; 1963-67, Assistant Professor, Department of Physics, Dalhousie; 1967, Associate Professor, Department of Physics, Dalhousie; 1967-68, Assistant Dean, Faculty of Graduate Studies; 1968-69, Acting Dean, Faculty of Graduate Studies.

Longval, Jean Rene. Born in Trois-Rivières, 11th December, 1924; Studies: T.D., Institut de Technologie, Trois-Rivières, 1955; B.Sc.A. Université Laval, Québec, 1961; M.Sc.A. École National Sup. de l'Aéronautique, Paris, France 1962; Ph.D. University of Saskatchewan 1969. Occupations: Bell Canada, summer 1961; University of Moncton 1962-65; University of Saskatchewan 1965-68, University of Moncton 1968. Member of the Engineering Institute of Canada.

Loucks, Leon F. B.Sc University of Toronto 1961 (Honours Chemistry); Ph.D. University of Ottawa 1967 (Chemistry under Prof. K. J. Laidler); Post-Doctoral Fellowship 1966-1968, National Research Council (Applied Chemistry under Dr. R. J. Cvetanovic); Assistant Professor (Chemistry) Prince of Wales College 1968-present.

Unger, Israel. Date and Place of Birth: March 30, 1938. Tarnow, Poland; Martial Status: Married with one child; Position: Assistant Professor; Department: Chemistry; Institution: University of New Brunswick; Degrees and Qualifications: B.Sc. Sir George Williams University, 1958; M.Sc. University of New Brunswick, 1960; Ph.D. University of New Brunswick, 1968; Academic and Research Experience: 1963-1965, Postdoctoral Fellow, Department of Chemistry, University of Texas; 1965, present Assistant Professor Department of Chemistry, University of New Brunswick; Member Chemical Institute of Canada; Chairman Chemical Subcommittee, APICS; Number of Publications: Fourteen.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Tuesday, May 27, 1969

The Special Committee on Science Policy met this day at 3 p.m.

Senator Maurice Lamontagne (*Chairman*) in the Chair.

The Chairman: Honourable senators, I believe we have before us 10 delegations from the Universities of the Atlantic Provinces and, if agreed, we will have two successive groups at the head table. First, because it is the biggest group—I am not going to make any qualitative evaluation at this moment—we will hear the delegation from the Nova Scotia universities, and then the second group, from New Brunswick, Newfoundland and Prince Edward Island. I would ask each leader, represented from each university, to make an opening statement, but I would advise that these opening statements should not be too long for the obvious reason that if they are, we will not have any time to ask questions.

I would ask each delegation to try to limit itself to five or six minutes. This is assuming, of course, that we have read the briefs, and I think it is a pretty realistic assumption.

I would first invite Dr. Beveridge, Dr. Langstroth, Sister Fietzgerald, Rev. Dr. Clarke, Dr. Bridgeo and Dr. Holbrook.

Dr. J. M. R. Beveridge, President (Academic) Acadia University: Thank you, Mr. Chairman. Mr. Chairman, honourable senators and distinguished visitors, as we have been warned by our chairman that it would be best not to read the entire brief, I will simply refer to the fact that the main thrust of our brief is the fact that the federal Government ought to become involved or more involved in the support of university work, not only at the level of graduate and research

work—I realize that all of these are closely associated and may not be looked upon as completely identical—but also in respect of the support of certain sorts of relatively expensive undergraduate faculties. For example, up to only about 20 years ago half of the provinces in our country had no medical school and even today, three of the ten provinces are still without one. Thus the main responsibility for providing medical doctors for the entire nation, up until a little over a decade or so ago, had to be accepted by five provinces. This is a most anomalous situation, especially when one considers that the federal Government has not, and does not yet provide appropriate support to these schools. One might well speculate, or ask at this point, to what extent the lack of formal federal or constitutional involvement in higher education has impeded the development of the universities and consequently of Canada as a whole.

The Chairman: I remember, sir, contributing \$2.5 million some few years ago for the construction of a medical school in Halifax.

Dr. Beveridge: Yes, I am sure you did. In terms of costs, of medical schools may I say this is a drop in the bucket.

The Chairman: I know.

Dr. Beveridge: Certainly, no one can deny that the universities have fallen behind in their efforts to provide adequate facilities for teaching and research for the numbers of students who are now seeking higher education. This is especially true of medical education. We have failed in our task to meet the demand for medical doctors.

What has been said with regard to medical education applies to a greater or lesser degree to a variety of other disciplines. For example, I am thinking of dental faculties, veterinary

medicine, faculties of agriculture and certain other highly specialized graduate programs. The fact that the federal Government in October, 1966, withdrew its direct support for the financing of university work and transferred this support entirely to the provinces, has made it necessary for the planning of higher education at least on a province-wide basis. It is obvious, too, that there is a great need for the same sort of planning, co-operation, and co-ordination in the provision of facilities for relatively expensive professional or other highly specialized faculties on a regional basis. This obviously ought to involve not one, but several contiguous provinces since no one province—the Maritime Union might be able to—certainly in the Atlantic region at least, is large enough to provide for a complete offering of degree programs in university education.

The point should also be made that when provincial governments have the responsibility of providing the major financial support to universities there will be a danger that conditions will be imposed creating a barrier for out-of-province students. Furthermore, this circumstance may prevent a student from being given an opportunity to take a specific degree program. The only acceptable solution is one enabling Canadian students to be considered for admission on an equal basis to any university in the country regardless of their official provincial origin or residence.

It is well recognized that universities have not only a provincial function but a national, and indeed an international one. If we continue to regard the support from governmental sources as being purely a provincial responsibility, inevitably the provincial interests served by these institutions will be promoted to the detriment of those of national and international significance.

The enrolments of our universities should be drawn not only from every province in Canada but also from a good many foreign countries. No one would argue the importance of this circumstance, yet by no stretch of the imagination can this be looked upon as serving a provincial interest. Even in the case of students attending institutions within a province of which they are resident, after graduation, being the most mobile component of our work force, many of them cross provincial boundaries not once, but several times during their career. Of course, it is well known that

this is an extremely important problem in so far as the Atlantic provinces are concerned.

The history of scientific discovery is replete with the important advances made by scientists working essentially alone. Although it is agreed that there are certain advantages in the group approach, our resources should not be so allocated that there is no place or support for the individual scientist working in a relatively isolated manner. We believe, therefore, that those working in this way should be given support within the reasonable limits imposed by the need to avoid the undesirable duplication of expensive facilities. If appropriate support is not forthcoming for those scientists who prefer to work in such an environment, science in the smaller universities will be crippled and the deleterious effects will not be confined to science faculties but will be felt throughout. Just to give an example of the sort of thing to which I refer, I have some data which has come to hand indicating the percentage of support from various fund granting agencies in the country to the universities in the Atlantic region. You may recall that the population of the Atlantic region, I think, is roughly 10 per cent of that of the total and I do not mean to imply by that, that funds should be distributed on a basis of population. The figures are as follows:

NRC 8.3 per cent

Canada Council 3.8 per cent

Medical Research Council 3.9 per cent

DRB 3.8 per cent

Although most of the foregoing remarks are just as applicable to the natural and physical sciences as to the humanities and social sciences, it must surely be recognized that by any standard of comparison our record of support for the latter has been abysmally poor. If we are to reap and to enjoy the fruits of our research and development in the realm of science and technology, it is patently obvious that comparable advances must be made in the humanities and social sciences. Only in this way can we look forward with confidence to an improvement in the quality of our life.

To sum up, I look upon an increasing involvement of the federal Government in the financial support of higher education as not only justifiable, but essential if Canada is to keep or to advance her position in the hier-

archy of nations in the years ahead. Failure to make appropriate provisions in this regard can have but one inevitable result, the relegation of Canada and Canadians to increasingly subservient roles in the future of world affairs. Thank you, Mr. Chairman.

The Chairman: Thank you very much, Dr. Beveridge. I do not know if I have said this at the beginning, but Dr. Beveridge is accompanied today by Dr. Smith, who is the Vice President in charge of Academic Programs.

Dr. Beveridge: I am sorry, sir, I should have told you that he was unable to come.

The Chairman: I am sorry. Now, I suppose that Dr. Langstroth is going to speak on behalf of the Dalhousie University.

You are not speaking on behalf of the university, but I presume that your brief represents the views of the Science Faculty.

Dr. G. F. O. Langstroth, Acting Dean, Faculty of Graduate Studies, Dalhousie University: Yes. I believe, sir, that our brief represents the views of the majority of the scientists at Dalhousie.

Mr. Chairman, honourable senators, and distinguished guests, very briefly, we, at Dalhousie, feel that a national science policy for Canada should be a policy which will define goals and assign priorities, taking into account the resources which Canada has, both in manpower and in physical resources and of the development of science policy elsewhere. The objective we submit ought to be the identification and development of those things for which Canada can gain an international reputation. If these aims and objectives are defined and identified then the policy ought to provide a co-ordinating mechanism. I may use Dr. Andrew's term, for the programs that fall within the policy so that all of the elements of the scientific communities can work together toward the national goals.

It is reasonable to expect that some of the goals will sort themselves out into regional problems and these can be tackled on a regional basis by the various scientists within Government, industry and the universities. We think it is very important that the matter of technical thought and communications among scientists throughout the various sectors of the scientific community and between scientists and the rest of society should not be

overlooked as the policy evolves. We feel that there are matters which need attention in this regard, at the moment, and that if we are to keep our place in the growing technological age, if you like, then it is necessary that we do develop appropriate technical information media. We feel that, in the area of applied research and so-called mission oriented work there is no fundamental reason why the universities should not be encouraged to participate in this work. I feel very strongly, however, that any undertaking of such work can only really be done on the basis of strong basic science and perhaps basic social science, humanities and art departments as well. Also, the support of basic sciences and social sciences and humanities are not adequately maintained and any attempt to indulge in mission oriented work is not likely to be successful in the universities.

We have not had access to copies of the Macdonald report for a sufficient length of time in order to produce a reasonable comment in regard to it, but I would like to make one or two observations about a couple of recommendations. First of all, we would endorse quite heartily the proposal that there be established a system for the awarding of project grants in addition to the present practice of making grants to individuals. We feel that these project grants are important to the development of interdisciplinary work of the kind which is apt to be useful to the region and to the country. On the other hand, we feel very strongly, that the support from the federal Government and direct support for the computer centres ought to be maintained. This is contrary to the recommendation of the Macdonald Report. Our reason for this is that we feel that the computer centre is like the library, a central university service and to withdraw direct support for it in places, funding in the hands of individuals, is likely to have the effect of decentralizing the service. We fail to see that this would be beneficial in the long run, particularly when one looks at a computer centre from a variety of points of view. It is used for teaching research and administering purposes and if we look ahead to a time of regional hookups of computer systems we feel that if there is not a central fund, a centrally supported computer centre, then the participation in regional activities is apt to be rather difficult.

One final point which I think ought to be drawn to the attention of the committee con-

cerns the existence of an organization called the Atlantic Provinces Interuniversity Committee on the Sciences or APEX, as we call it for short. This was formed in 1962 and the purpose of it was co-ordinating the development of teaching and research in science and engineering in the Atlantic provinces. In 1964 the committee was adopted by the Association of Atlantic Universities as its official science committee. The members are the deans of science and the deans of graduate studies from the participating universities, and in addition, the directors of the federal Government laboratories in the area. The committee operates a number of programs, although it does not have administrative authority. It operates a scholarship program and programs for exchange of staff among the universities on a temporary basis and maintains a number of discipline subcommittees which meet regularly in order to air their common problems and to try to see how the various institutions in the Maritime region can better co-operate with one another.

Finally, I might mention that we have had some experience in co-operation in our university with the various Government laboratories. They have taken a variety of forms with a variety of degrees of formality in the arrangements. In order to illustrate this, with your permission, Mr. Chairman, I would like Dr. Keen to make a few remarks about oceanography, as it represents, first of all, an interdisciplinary kind of activity and also one in which there has been a good deal of co-operation and participation, jointly, by the university with the Government.

Dr. M. J. Keen (Chairman, Geology Department, Dalhousie University): Mr. Chairman, honourable senators, ladies and gentlemen, Bedford Institute is a federal Government institution for oceanography which is in Dartmouth, Nova Scotia and Dalhousie is in Halifax, only two or three miles away. As a federal institute it is probably one of the largest oceanographic institutes in the world, and one of the best. We have been engaged since the foundation of the institute and before that—it was preceded by the formation of an institute of oceanography at Dalhousie University—in some co-operative programs which are by and large carried out through informal arrangements. By and large, the co-operative programs work only because of personal relationships. There is very little formal structure

set up at the present time so that if people started fighting together then I think there would be no co-operation. People do not fight together and there is co-operation. The sort of co-operation which goes on is a two-way process.

You may find a federal Government employee on educational leave who wishes to take an advanced degree in things marine, which may or may not be a degree in oceanography. It may be a degree in something else, geology, physics or whatever. He will often be given leave to come to Dalhousie University. He may well be working on a project for his thesis, which is of interest to Bedford Institute who are his normal employers. On the other hand, a staff member or student at Dalhousie who has nothing to do with the federal Government and is not employed by them may often need facilities which Bedford Institute has and these facilities may be made available. A recent example of a co-operative program is Hudson 70, the scientific investigation around the Americas. This is a federal Government expedition on Hudson and funded by the federal Government.

There is a large number of scientists from Dalhousie directly involved in leading projects which are being carried out on Hudson 70. Again, a number of scientists at each institution felt that one area was neglected and so we proposed that we should carry out a minor expedition in association with Hudson 70. This sort of joint approach proves profitable. But it must be a joint approach, not a one-way affair. It is my personal opinion that, at least superficially, the Government agencies have so very much more money and, consequently, more facilities than the universities have that the universities are, in a sense, the poor relations. Perhaps this is because one does not include in the accounts the cost of the teaching facilities or the ability to teach when you are attempting to evaluate two institutions. I was a little disappointed this morning when Mr. Andrew excluded from the responsibilities of his correlating committee overall research, including the effort of the federal agencies, and tended to concentrate only on the research efforts of the universities. It seems to me that if the country is putting effort into inland waters, for example, you should investigate the total effort, not just the university effort.

So I think in summary the relationship between Bedford Institute and Dalhousie University is a rather healthy one. I am sure there are many ways it can be improved. By and large, however, it works largely because personal relationships allow it to work.

The Chairman: Thank you. Sister Fitzgerald.

Sister (Doctor) Mary Evelyn Fitzgerald, Mount St. Vincent University, Halifax, Nova Scotia: Mr. Chairman, I did not come prepared with a brief because I had not been told ahead of time, but since I represent the only women's University, and the smallest, I think probably that, as a member of the AUCC, I should come forward when my name was called.

We certainly feel that we should still have support for faculty research from the federal government, and the remarks of Dr. Andrews with regard to funds for research along educational lines as well as along project lines, we think, is something that needs to be implemented more strongly than it is at present.

I think I cannot say too much more about the university's policies with regard to this as we are currently talking with Dalhousie University on some form of cooperation, and I am not sure exactly what the status will be in the future. Thank you.

The Chairman: I am sure that these negotiations will be successful and that your university will be able to make a great contribution to Dalhousie because of your special approach.

Some hon. Senators: Hear. Hear.

The Chairman: Now, Dr. Bridgeo. Dr. Bridgeo is the Dean of Science at St. Mary's University, Halifax.

Dr. W. A. Bridgeo, Dean of Science, St. Mary's University, Halifax, Nova Scotia: Mr. Chairman, honourable senators, ladies and gentlemen, the authors of our brief are committee appointed by the chairman of the department of science faculty of the university. The authors agree that the question of a national science policy is very complex and yet very important to the health of the country, to economic health almost directly, intellectual, and even spiritual health a little more

indirectly. We do not pretend to know all the answers.

I must say that, after hearing Senator Lamontagne speak in Montreal, yesterday, I thought I would buy my ticket and go home because he impressed us with all of the people he has spoken to to date. I am sure you have much background. However, we pass on our ideas as objectively as we can on a few points which we feel should be considered by you.

No. 1, we ask that you seriously consider the role of the undergraduate science faculties as feeders of our graduate schools and the country's scientists of tomorrow. We suggest that this feeder role, if well-played, is an integral part of any program to strengthen the country's position in science and technology. One example of this feeder role re astronomy is presented as an addendum to our brief.

No. 2, we ask that you consider research in psychology, including experimental social psychology, as worthy of a place in a national science policy. Man's prowess in the physical sciences has far outstripped his ability to solve the "people" problems. I will suggest in a moment that the problem you face in constructing a national science policy is as much a people problem as it is an economic problem.

No. 3, we suggest that professors in undergraduate science faculties should be encouraged to do some research involving their students, where possible, and that a good portion of such research be aimed at or relevant to real problems in this country. This can be done and it can be done furthermore as a group effort between disciplines. An awareness of this research going on in universities, an awareness on the part of the students, and an involvement by some, will help to orient many people on what is involved in science research and development and how it can be used.

I would like to refer once again to the Senator's talk of yesterday where I understand that many of your committee visited influential people all over North America and had visits from people abroad to get some knowledge in depth of what is involved. We suggest in our brief a few phases in which this can be helped along.

No. 4, we point out that people, individuals or small groups of individuals, conceive ideas

and reduce these ideas to practice. It may be necessary to have bigger groups of supporting staff in the country. The supporting staff may have PhD's, they may be involved in university teaching or they may be involved in commercial service laboratories, but they are still supporting staff. It is the first group that deserves the heavy support, including streamlined fiscal control and purchasing policy. They should be permitted to buy it and fly it.

We suggest that it is very easy to stifle these valuable people in this country and that some way be found to release their energies, harness their ideas and skills. We suggest that industry be given another chance to do it. At the same time, however, make it easy for such people to form their own companies, if necessary, possibly in association with universities, and assist in financing. Levies possibly could be made on those big industries which refuse to do research in industry to help pay the costs of it. The funds could be channelled through such bodies as you are considering, such as the regional development agency.

Finally, we suggest that education and science form the foundation of economic growth for the remainder of this century. Insofar as our economic growth has a regional pattern, education and science policy should be considered on a regional basis. Thank you.

The Chairman: Thank you very much. Dr. Clarke, please. Dr. Clarke is from Nova Scotia, Antigonish.

Rev. Dr. E. M. Clarke, Head, Department of Physics, St. Francis Xavier University, Antigonish, Nova Scotia: We generally agree with the speakers from the Maritimes on these four regional developments. The first point is the necessity of development in Canada, that if we are going to compete in this present day world we have to look for very high technical competence, and this does involve spending money.

When it comes to spending public money we propose that the social implications of this spending should be considered very, very intensively and that areas which are now underdeveloped could be helped by fairly intensive research developments in those areas, but basically this development would be through the universities as far as fundamental research is concerned. However, we also

would like to see perhaps an extension of the National Research Council laboratories into other regions so that they could act as centres for information and, as Dr. Bridgeo has mentioned, a chance for some of their workers to spawn new ideas, as you have had in California, Cambridge, Mass., and so on.

To get the universities going on this, and I am speaking here really for the small universities, we need some base funds so that we can get enough staff and a small research group going so that we get the competence to apply for these larger grants. If we are cut off completely from this basic support it will then be very difficult for us to get above that stage.

I note with rather a bit of sadness in this MacDonald report table 3-3, that 15 of the universities in Canada do not get any research support at all. This is something that really should be pushed by the granting agencies.

The essence then is that more of the research funds should come from the federal government. At present they are coming through the province. Fifty percent of our funds come from the province.

There is pressure from the activist students, and there are others, that we are not spending enough money on the arts faculty, that the ratio of science students to faculty is much more favourable than that of the arts students to faculty. If we are forced to withdraw provincial funds from research in order to increase the arts faculty we will be in serious difficulty when it comes to doing significant research unless we have funds from the federal government that are tagged. And we need to have a bit more than the amount necessary just to get equipment; we need some additional support on buildings and possibly on research workers. Thank you.

The Chairman: Thank you, Dr. Clarke.

The last one on my list is Dr. Holbrook who is the president of the Nova Scotia Technical College, Halifax, Nova Scotia.

Dr. G. W. Holbrook, President Nova Scotia Technical College, Halifax, Nova Scotia: Thank you, Mr. Chairman. Ladies and gentlemen, I would like to speak from the engineering point of view because my institution is somewhat unique in that we only conduct the first degree and higher degree work in engi-

neering and architecture. In order to give you the setting of this, I should explain that we accept students into our university in the junior year level from eight or nine other Atlantic colleges or universities. In addition to Nova Scotia Technical College there is a complete engineering school at the University of New Brunswick, another one at Moncton, and a fourth one forming in Memorial, Newfoundland.

We, as Nova Scotia Technical College, did contribute to the brief which was sent in by the Canadian Deans of Engineering and also by the Committee of Deans of Graduate Studies. On the other hand, I think there are two specific points I would like to raise from the Atlantic provinces' point of view with respect to engineering. We, as an engineering school, I believe, are very much closer to industry perhaps than other disciplines. We are the almost intimate interface between the university and our local industries. Consequently, I think we have a particular role to play.

In the Atlantic region we have very few industries, if any at all, locally based ones, which have any research divisions of their own. There are one or two industries that do have research facilities in the Maritimes but they are, generally speaking, based on large organizations in central Canada. Consequently, we, as an engineering school, probably have the only kind of heavy engineering testing equipment which is available to some of these firms in the region. Consequently I think we have a commitment to local industry to provide some kind of service to them which they cannot possibly afford to buy themselves as individuals.

I think that applies as well to their desire to do research and development. None of them are big enough, or very few of them are big enough to get involved in research programs themselves. However, in combination with engineering schools, a very viable form of research or development can take place with a measure of cooperation between the industry and the college. To this point we have established, with the aid of the old federal Department of Industry, one of the industrial research institutes, which is based upon my college, the Atlantic Industrial Research Institute.

I would like to think that in your deliberations you would tend to emphasize the work which these industrial institutes can do in

bringing together the local industries and the engineering schools, with particular reference to the Atlantic region where industries do not have the capability of doing research themselves.

The second point I would like to make is that I believe research, which I think should be encouraged in engineering programs, should have some regional connotation. I believe that we should be interested in the ocean at Halifax and in some of our mineral deposits. I find it rather strange that universities in central Canada are developing programs in coastal engineering and in seaweed and things like that. Perhaps there should be more stress placed upon the encouragement of research, certainly from our point of view in the Atlantic region, on our Atlantic resources. Thank you.

The Chairman: Thank you very much.

Well now, if you would perhaps regain your seats and remain available for the question period, I would now invite the representatives from the University of New Brunswick, the Université de Moncton, Memorial University and Prince of Wales University to come forward. We will hear first from Dr. Burt who is Associate Professor Biology of the University of New Brunswick, speaking on behalf of his college.

Dr. M. D. B. Burt, Associate Professor of Biology, University of New Brunswick, Fredericton, New Brunswick: Mr. Chairman, honourable senators, distinguished visitors, the brief we are submitting is one that has been prepared on behalf of the science faculty at the University of New Brunswick, and it has been put together by four members of the science faculty. The other three members are present: Dr. Pajari, Associate Professor of Geology, Dr. Unger, Assistant Professor of Chemistry, and Dr. Young, Assistant Professor of Physics.

I would like to make it clear, Mr. Chairman, we are speaking here from a somewhat restricted point of view, being concerned primarily with the research itself, and we hope that the remarks we have to make will be of some use to your committee in their final deliberations concerning an overall science policy for Canada.

In Canada, as in many other countries, a large number of highly qualified scientists are

doing research in universities. In view of the increasing demands being made on federal funds to support research and development in several different spheres we welcome this opportunity to present a rather short brief outlining what we believe to be the most cogent arguments for not only continuing, sir, but even increasing financial support of scientific research in Canadian universities.

In summary, if I may just present the major points we cover in the brief, first we strongly recommend that federal funds to support scientific research in universities should be substantially increased for the following reasons, and there are four reasons here:

Firstly, the quality of university scientific research is high while the contribution of university scientists to scientific knowledge per se is substantial and has been made at fairly modest cost.

Secondly, only by increasing the number of graduate students can Canada continue to improve standards of education, government, and research at all levels. This improvement of standards, by upgrading scientific positions in most fields is essential if Canada is to remain a technologically advanced country.

Thirdly, as it is impossible to predict through foresight which basic research will have useful application at a later time, the continued investigation of basic problems in universities is utterly vital and invaluable to research in its broadest sense and to the eventual success of applied research.

Finally, it is vital to our national cause to possess and continually increase that body of research scientists not only for their productive capacity and output of new knowledge, but also for their expertise and technical know-how. This body, we believe, is the only one available to focus on any problem, fundamental or technical, of national concern.

The second point we would like to make in the summary here is that we would strongly recommend that federal funds supporting university research continue to be distributed by NRC for these two reasons:

Firstly, this uniquely Canadian method has proven itself to be an eminently suitable one which has, in large measure, been responsible for attracting many excellent scientists to Canadian universities from other countries as

well as for keeping our own scientists. We believe also that this particular method has kept a number of people in Canadian universities who might otherwise have been tempted to leave Canada.

Secondly, it allows for the best possible assessment of applicants by the finest researchers in Canada in every different field, thus ensuring that awards are granted on a sound merit basis.

The third recommendation that we would put to you is that the total amount spent by the federal government on research and development increase as a proportion of the Gross National Product. In this way additional financing of industrial and applied research would be possible without adversely affecting the vital role which universities play.

Finally, we would recommend that some of the additional funds referred to above be made available to allow cooperative research between government, industry and universities. In this way the available scientific expertise in Canada could be brought to bear on national problems and, in fact, could be used to maximum advantage. Thank you, Mr. Chairman.

The Chairman: Thank you.

[Translation]

Now Dr. Longval, who is Director of the Engineering Department, and is representing the University of Moncton here today, I believe.

Dr. Jean-Rene Longval, Director, Department of Engineering, University of Moncton, New Brunswick: Mr. Chairman, Senators, honoured guests—the University of Moncton, which I represent before you today, is a young and as yet a small institution. Its establishment actually dates only from June, 1963, when the New Brunswick government decided to merge all French-language institutions of higher learning in the province into one. The university so formed now comprises Bathurst College, formerly Sacré-Cœur University, St-Louis College, formerly St-Louis d'Edmundston University, St-Joseph College, formerly St-Joseph de Memramcook University, and the women's colleges of Maillet, St-Basile and Jésus-Marie de Shippagan; these institutions now form the Faculty of Arts of the University of Moncton. In 1968-69, the Faculty had a student enrollment of 1,306 and

a teaching staff of 130. Apart from St-Joseph College, the Moncton campus accommodates the Faculties of Science, Commerce, Education, Psychology, Social Science, Nursing and Domestic Science. In 1968-69, these specialized faculties had a total of 1,010 students and 88 professors. In the same year, the Faculty of Science, which embraces the Departments of Physics and Mathematics, Chemistry, Biology and Engineering, had 260 students and 32 professors. I would ask the honourable Senators to excuse my quoting all these statistics, but they will facilitate better understanding of the rest of my remarks.

Such a new and small university certainly cannot have any great influence on decisions regarding scientific research policy in Canada. With your permission, I shall therefore deal rather with the influence such decisions can have on the smaller universities, such as the one I represent. Our university will have to conform to whatever shape our national science policy takes in the future; nevertheless, your recommendations can have a major influence on the development of small universities.

Recent trends in the allocation of funds to scientific research give one reason to believe that, in future, such investments will be determined by concern for the greatest possible effectiveness. The validity of this objective is doubtless indisputable, but we are uneasy about the ways in which it will be pursued. If the goal of efficiency were to require, as an absolute rule, that research in a given field be centralized through the collaboration of several researchers, then institutions such as my own would be deprived of subsidies for work in a number of areas. As you know, it is difficult to conceive a university science program that does not offer professors the opportunity to conduct research. It is possible to question the need for this, and to recommend that some institutions limit themselves to teaching and exclude research, but universities adopting such a course would find it extremely difficult to recruit a competent teaching staff. It seems essential to me, therefore, that whatever decisions are made regarding future science policy in Canada will have to allow the smaller universities to carry out scientific research; without such provision, some institutions regarded as essential components of our educational system will find themselves in a precarious position, and will eventually have to

close. I must confess, Gentlemen, that I am alarmed at the thought of such a future for the University of Moncton, which is regarded with good reason as one of the keys to Acadian survival, and of which the Faculty of Science is an important part.

If the work of isolated researchers is relatively unproductive—which may not be absolutely true in all fields—then the policy of subsidizing agencies should be to bring the researcher out of his isolation, rather than to discourage him by offering only minimal subsidies. Professors in a small institution are mostly isolated researchers. In most cases, team work would be much more productive, but present subsidy arrangements do not favour teams made up of researchers from groups of neighbouring universities. Furthermore, collaboration between professors from our universities and researchers from government agencies is often difficult because of the distances separating us from government research centres. Thus, two elements of a solution to the problem become clear: the setting up of a system of subsidies for frequent travel to neighbouring universities by professors wishing to join research teams, and the establishment of government research laboratories near the campuses of the smaller universities.

As far as research is concerned, the problems we face at the University of Moncton were expressed very well by Dr. Schneider, in his address to the last seminar of the *Atlantic Provinces Inter-University Committee on Science* meeting in Fredericton on May 27, 1968; I quote:

[English]

These no doubt would work exceptionally well if each institution started from the same base as far as staff and resources, both as far as money and manpower are concerned, but here one finds a considerable disparity, and over a longer term the rich get richer and the poor have difficulty getting off the ground. The maritime provinces constitute a region in which the resources available to local universities are generally below those of the other provinces. In Francophone universities science tends to have a more recent origin and there is now a determined effort to catch up. In contrast, Anglophone universities have built up their science programs over a long period and tend to be more developed.

[Translation]

The university I represent enjoys the three-fold privilege of being young, French-speaking and located in the Maritime provinces. Should an institution in such an unfavourable position close its doors? Possibly; however, I dare to hope that this Committee will present the competent authorities with much more constructive recommendations, which will permit the most effective use possible of the human potential of the University of Moncton.

The Chairman: Thank you very much, Dr. Longval. I trust the University is going to continue its courses, with occasional co-operation from the students.

Dr. Longval: Yes.

[English]

The Chairman: Now we will hear from Dr. Loucks from Prince of Wales University, P.E.I.

Dr. L. Loucks (Prince of Wales College, Charlottetown, Prince Edward Island): Mr. Chairman, I have not submitted a brief but I have a number of points that I would like to outline very briefly. I represent the science faculty at Prince of Wales College and very shortly Prince of Wales College will become part of the University of Prince Edward Island with the amalgamation of St. Dunstan's University and Prince of Wales College.

First of all, we support the efforts that are being made to develop a single science policy for Canada, and I wish the committee well in that. We feel that the social sciences should certainly be included and, if possible, the humanities should be supported. These areas need stimulation in Canada. The traditional sciences have had support for many years and the programs in Canada have been well-developed and we have been able to produce PhD's to staff our universities. However, in the social sciences and the humanities things have not been as easy for those students who wanted to take postgraduate work.

I think that the centres of excellence must not be the only locations for the research that is done in Canada. At the same time I would not say that we have to eliminate centres of excellence like NRC. I don't suggest that. However, I think that we must support the small universities and, in particular, there is

a special problem for those colleges which offer only an undergraduate program. At such an institution the conducting of research becomes more difficult because you have no postgraduate students that are working for you. In such a location the grants to the staff members are essential and must be continued to buy not only the specialized equipment that you may need over and above the equipment you have in the university for the undergraduate courses but also to supply the technical staff, both in the form of summer students and in the form of technicians.

We feel that it is obvious that selection of a university for an expensive project may well be necessary in the future in order to avoid duplication of expensive facilities. This will necessarily mean that some universities will not get their first choice projects and will have to do with something that is second choice. I think this is fair enough because any good scientist must have more than one good idea. And I think this is one region in which money can be saved.

One thing I think should be kept in mind by the committee and that is that scientists guard very jealously the projects they wish to work on. A science policy that would give money only for a project which has been selected and assigned by a government agency would not be a healthy policy, with which the researcher could work, and we suggest it would in fact be a dangerous policy.

The Chairman: Thank you very much. Our last speaker is Dr. Laird.

Dr. Laird, I must remind you that you are not alone in your province to speak last. Every time your Premier attends federal-provincial conferences he speaks last.

Dr. M. Laird (Head, Department of Biology, Memorial University of Newfoundland): Mr. Chairman, honourable senators, distinguished visitors, Memorial University's brief has been submitted but as, until the end of last week, our President, Lord Taylor, was to have been our representative here, I arrived without any kind of written submission. However, I believe that much of Memorial's contribution to this special committee's deliberations can be summed up under four headings:

Firstly, we at Memorial are very much in favour of the promotion of more effective research coordination and I will try to make this clear by specific example in a few minutes.

Secondly, at the same time we live on an island, as recent postal and air transportation problems made painfully clear to us. Living as far as we do from Halifax poses special problems to us as regards close participation in future regional pools of sophisticated equipment, such as electron microscopes, for example. And, furthermore, we are a one-university province. We therefore have a demand for research support that might at first sight seem overly ambitious in a province that is still sadly underdeveloped. The reference in this special committee's preamble to gaining experience from other industrialized countries does not really apply to us yet. For all that though we are already among the first ten Canadian universities in terms of student body, with more than 5,000 at the present time.

Thirdly, we are not experiencing trouble in getting good faculty, but space for these faculty and their equipment is another matter. In fact, we find ourselves, because of the underdeveloped level of the province, running into a special problem of being unable to apply for the kind of research support that our present faculty could qualify us for because we simply do not have the space to house the equipment and additional faculty and non-academic staff who might be brought in under grants. So this makes us especially receptive to the item in the Macdonald report that refers to 35% of the direct cost of research being made available for indirect costs. This would seem to be a very important item to us, as would the provisions of some form of capital cost assistance by the federal government in order to make additional buildings feasible.

Fourthly, uniqueness of site was mentioned this morning, and I would like to close on this item by giving a specific example. In the research field, Memorial is trying to exploit uniqueness of site to develop centres of excellence at the national and international levels, and the most advanced of the auxiliaries we have at the present time in our biology area, and at the same time the most ambitious of our total research undertakings, is the Marine Sciences Research Laboratory. Note that word "Sciences" and not "Biology". Every effort is being made to encourage interdisciplinary studies at the Marine Sciences Research Laboratory where chemists, biochemists, physiologists and representatives of our new

medical faculty are already working together with biologists.

International as well as national advice has already been sought in building up a long-term research program for the Marine Sciences Research Laboratory. Last year a scientific advisory group was convened, consisting of six scientists from the United States, from Iceland, from France and Italy as well as from Canada, supported by background documentation specially prepared for the meeting by more than fifty scientists in a dozen countries elsewhere. And all of these participants and authors of background papers had in common a deep interest in the colder waters of the North Atlantic, which colder waters wash, often with considerable force, right up to the doors of our Marine Sciences Research Laboratory.

The point of the meeting was the preparation of a report which will soon be published indicating long-term planning based upon a desire not only to make maximal use of our year-round supply of circulating sea water, and very pure sea water at that, on the east coast, but also our access to the open North Atlantic in undertaking research for which we have the personnel and equipment, and at the same time we wanted to implement this research in such a manner as not to duplicate but rather to augment and supplement work in progress under other auspices elsewhere.

Looking at the total picture of research in this particular subject area from where we sit at St. John's, we like to envisage a future pattern of close collaboration between our Marine Sciences Research Laboratory, the proposed new consortium at St. Andrew's, which will be the Ontario outlet to the sea which was spoken of earlier, the existing facilities of the Bedford Institute and the new Aquatron at Dalhousie, as well as McGill's Bellairs Institute in the Caribbean. We look forward to all of these institutes collaborating in a pattern, each of them as one part of a mosaic, if you like, collectively constituting an eastern Canada centre for marine studies that might, by careful planning at the very earliest stage, succeed in putting together a research program that will really preclude unnecessary duplication and that will promote real collaboration between those stations best fitted to participate in this kind of scientific undertaking.

The Chairman: I would ask Dr. Beveridge to come back as well as the others who were before us previously, to get near this table.

Now, we will have our usual question period. I would like to tell our guests of today that within our committee we have a very powerful lobby for the maritimes. We have at least four senators from your area. I will ask first Senator Phillips from Prince Edward Island to begin the discussion.

Senator Phillips (Prince): Mr. Chairman, you have taken me rather by surprise. I thought I was going to be able to benefit from the questions asked by previous questioners.

I noticed Dr. Beveridge referred to support for the undergraduate schools. He emphasized the extensive nature of schools such as medical schools and dental schools.

I am not quite sure, Dr. Beveridge, whether you were advocating more schools of this nature within the Atlantic region or merely pointing out the...

Dr. Beveridge: No, I was not advocating more schools of that nature in the Atlantic region. I understand, for example, that Memorial's plans are well along for the establishment of a medical school. This will be an albatross around the administrator's neck, I am sure, for some time to come. I was simply emphasizing the fact that in the past history of university education in Canada, despite the constitution which indicates that education is primarily a provincial responsibility, it has not been that in any real sense of the word, and it still is not now.

Senator Phillips (Prince): I am not expressing opposition to the fact that Memorial is going ahead with a medical school. I have discussed this with Dr. Stewart, the dean of medicine at Dalhousie, and he has expressed support for another medical school within the Atlantic provinces but has two reservations, one that everyone has, finances. I am sure you had that in mind when you remarked it would be an albatross. But, secondly can your Atlantic province universities turn out students not only to go into medical schools but graduate students to support the medical staff? For instance; if you need an embryology teacher you don't necessarily have a man with a medical degree. He is probably a biologist specializing in embryology.

Dr. Beveridge: Well it could be either. Medicine, after all, is human biology applied.

Senator Phillips (Prince): It seems to me that would be an awful waste of medical talent, to restrict him to teaching embryology.

Dr. Beveridge: Well, not necessarily. I would have to put it in those terms. I think the answer is that if we have adequate financial support, certainly we can turn out the graduates to staff a medical school in Newfoundland or elsewhere in the Atlantic region. However, we must have support for graduate work in the medical field, and also in the basic medical sciences.

Senator Phillips (Prince): I was impressed by the figures you gave concerning the allotment of research money. I notice the Defence Research Board, according to your figures is 3.8%. Now, does the Defence Research Board have any association with the Atlantic university group? Or do they operate entirely independently? Do they ever go to you for assistance in a project such as the American universities have happen?

The Chairman: If I may interrupt, Dr. Beveridge, I would like also as we go along and invite all those who have appeared before us this afternoon to join in the discussion whenever they feel like it. They have only to ask me and I will recognize them too.

Dr. Beveridge: Well, I think for the most part the Defence Research Board, as do most other fund-granting agencies, simply announces its policy on the granting of funds and the conditions under which these funds will be granted. These are circulated to all people who would be potentially interested in obtaining funds in this way and, if it so happens that they have some interest in research that has a relationship to defence, and I must admit that in many cases, and I have been a member of one of the Defence Research Board panels, the relationship to defence is sometimes a bit far-fetched or at least tenuous, but nonetheless very often money has been granted. I don't know of any instance in which the Defence Research Board has approached universities in the Atlantic region but I am quite sure that they probably have in one respect or another.

Dr. Holbrook: May I speak to that, Mr. Chairman?

The Chairman: Yes.

Dr. Holbrook: We have had quite a good liaison with the Defence Research establishment Atlantic whereby we have undertaken research for them on a contract basis. We have, of course, also had grants-in-aid from the Defence Research Board itself. We also have had part-time graduate students, young engineers, who are working at the Defence Research Board Atlantic, and taking a post-graduate program with us on a part-time basis. And they have certainly come to us asking us to take on contract research on their behalf. So it does happen.

By the way, I think Dr. Beveridge's figures were on grants rather than on contracts probably.

Dr. Beveridge: I think that they were, yes, on grants. I am not sure that contracts were excluded.

The Chairman: Were these similar figures to those that were published in the Macdonald study? I remember there was some kind of regional distribution of money but I don't know if these figures covered it.

Dr. Beveridge: I have forgotten whether they were taken from that source. I must confess that I obtained them at the recent meeting of the Science Council.

Senator Robichaud: Were you referring to the grants given to universities?

Dr. Beveridge: Yes. Well, to researchers or investigators at universities.

Senator Robichaud: With regard to those grants, where about 4½ per cent of the total grants...

Dr. Beveridge: No, more than that.

Senator Robichaud: ...went to Atlantic universities; now, were those based on the population of the Atlantic provinces or on the total enrolment of the universities?

Dr. Beveridge: No, those are the percentages of the total amount of money disbursed by these fund-granting agencies.

Senator Robichaud: If you relate those figures to the total enrolment of the Atlantic universities compared to other universities, the percentage could be different.

The Chairman: It could be higher, I am sure.

Dr. Beveridge: Well, the total enrolment in the Atlantic universities compared to the entire Canadian university enrolment is a little over 10 per cent. So that by any measure other than that having to do with the enrolment of graduate students, but certainly on the basis of population or university student population, the proportion of funds granted is rather low. However, on the basis of graduate enrolment there is a closer correspondence.

Senator Phillips (Prince): May I say I was very interested in Dr. Keen's report of the cooperation between Dalhousie and the Institute of Oceanography at Bedford.

I have long felt, Dr. Keen, that probably a great many of our government research agencies could probably be working more closely with universities or indeed placed directly in the universities. Take, for instance, the Department of Fisheries; I often criticize their research people. They can pinpoint a specific fisheries disease but they cannot go beyond that, such as to associate it with the effect it has on the fishermen, which is really a very essential part of the problem.

Do you feel that, as a result of your cooperation with Bedford, that probably this type of research could be handled better in the universities than through a government agency?

Dr. Keen: I think there is always going to be a lot of difference of opinion as to the general question, should a research institution be on a campus under university control or should it be in the hands of a federal agency. I don't believe the Macdonald report examines this question in anything like the detail it should have done. In only one of their recommendations do they even touch upon it.

You can take the point of view that a university should not be concerned with routine work or with data collecting if you like, that it should look at other things, but nevertheless you can also take the point of view of looking at the foreign institutions, such as the one I always think of, which is Lamont Geological Observatory, which is the best marine institution in the world of things geological and geophysical, and our own Canadian policy would not allow the establishment of such an institution. You can then go on to Bedford, and do you want it on the campus or indeed would you in 1969 or 1970, would you want to establish such an institution because it is an historical fact of its time? The answer may be no, you don't.

You must find a way of ensuring much greater cooperation. We must ensure that the calibre of work done by such an institution can be done in Canada. The way I see it happening, the most viable way, is either by putting research establishments on campus or with federal institutions such as Bedford Institute, making sure that cooperation is a two-way affair, not a one-way affair. Sometimes the situation arises, say with the geological survey of Canada with such an institute, that a student will, as it were, acquire a problem from that institution and he will deal with it at the university with the tacit encouragement of the university and will be supervised in the university. This, it seems to me, only allows marginal interest on the university's part, and the two-way process of the university's purpose and the federal purpose with students working as a triangle is going to be much more healthy, and this is certainly what we are trying to do at the present time. It has to be a triangle, it cannot be just a one-way affair.

Senator Phillips (Prince): If I recall your remarks, Dr. Keen, you said you cooperated mainly because you had no format or rules laid down.

Dr. Keen: No, there was no "because" in there. There were no formal rules.

Senator Phillips (Prince): Would you care to have a Minister of Science lay down a definite guideline or would you prefer to work as you do now?

Dr. Keen: I would have thought there would have been considerable value in having a formal association between two institutions such as Dalhousie and Bedford Institute. Yes, I think this would be valuable. At the present time you could say it is not necessary but in, say, joint graduate programs between Bedford and Dalhousie, yes, formal arrangements could be most valuable. That is my personal opinion. I do not speak for anyone else.

The Chairman: Two of our guests here have asked me to make some comments on this. First, Dr. Burt.

Dr. Burt: Mr. Chairman, there is something I would like to say here generally endorsing what Dr. Keen has said. We find in Fredericton, for instance, at the University of New Brunswick, that there is considerable cooper-

ation with the Fisheries Research Board in St. Andrew's, that it does not represent only the Ontario outlet to the sea, Dr. Laird, but also the New Brunswick outlet to the sea.

By way of example, we do have in Fredericton, for instance, an electron microscope complex which the people in St. Andrew's make fairly substantial use of. And, by the same token, we in Fredericton, particularly in the biology department, make substantial use both of the facilities that they have at the station there and also of their ocean-going vessels. This is a very close tie but I must say again it is built on the whole business of personal relationships.

I think all of this comes right back down to the ability of one researcher being able to go to another one and perhaps, knowing him personally, saying, "Well, what about it? Here is our problem. Can you help?"

The Chairman: Would you like to have these relationships more formalized?

Dr. Burt: Again I would agree, yes. I think that if there is some kind of formal association laid down it makes it a lot easier to establish the relationship. Otherwise, it takes a long time for a person settling into a university to get to know the staff at the other place and to get to know in what areas one can help.

The Chairman: Dr. Laird.

Dr. Laird: Mr. Chairman, the purpose of my intervention was actually to make good the admission that the previous speaker just referred to. In fact, we are very well aware of these other aspects of the proposed new consortium at St. Andrew's, and I should have also of course mentioned the Fisheries Research Board labs in the Atlantic provinces in general as part of a sentence that got out of control.

However, I would like also to say that I most heartily endorse Dr. Keen's remarks. At Memorial we have excellent working arrangements with the St. John's biological station of the Fisheries Research Board of Canada. The director of that station is an honorary professor in the department of biology. There are graduate students who are supervised at the Fisheries Research Board while maintaining regular contacts with the campus. And under our building program it is planned that a fine, new Fisheries Research Board station

will actually be constructed on our campus in close proximity to the new Life Sciences building. When this happy stage is reached we anticipate a very much more formal working arrangement with additional members of the staff of the FRB station participating quite actively in work at the biology department itself, and with sort of a reverse lend-lease aspect, with laboratories at the FRB establishment being made available to people working within the department of biology.

The Chairman: Dr. Beveridge.

Dr. Beveridge: Mr. Chairman, I was simply going to speak along the same lines as the previous two speakers...

The Chairman: There is great unanimity here.

Dr. Beveridge: ...to indicate that this, as a matter of fact, is a policy that is now being actively followed by the Fisheries Research Board. I should explain I have just come off this board after a period of ten years as a member. A few years ago I chaired a committee having to do with making recommendations for the relations between the Fisheries Research Board and universities. This was one of the recommendations which was made from this committee, that in the future when new institutions were established we ought to attempt to establish them either on the campuses of certain institutions or as close to the campuses as we could.

I should point out that the Pacific Fisheries Experimental Station is, for example, on the campus of the University of British Columbia. The Fresh Water Fisheries Institute is established on the campus of the University of Manitoba, and there is a close relationship between the faculty, the relevant departmental members of the university, and the members of the staff of that station. And of course reference has already been made to the situation at Memorial. So I think that this is the sort of thing that we ought to look forward to increasingly as time goes on.

Senator Robichaud: If I may add on this matter of co-operation...

The Chairman: This is Senator Robichaud from New Brunswick, who is a former Minister of Fisheries.

Senator Robichaud: The Department of Fisheries in Montreal at McGill in connection with the work done at McGill University, and also Laval University, has been approached to have certain land available in order to build a special lab for the Province of Quebec. So there is definitely close co-operation between the Fisheries Research Board and the different universities.

The Chairman: Yes.

Dr. Langstroth: Mr. Chairman, I just wanted to say that in addition to the close working arrangements which Dalhousie enjoys with Bedford Institute of Oceanography, which Dr. Keen has described, we do have two other arrangements, one with the Fisheries Research Board in Halifax, and the other in connection with the Atlantic Regional Laboratory of the National Research Council. It is to the latter I want to speak because this has two features about it that may be of interest.

The first is that the Atlantic Regional Laboratory is on the campus and it affords therefore a model or example of the kind of situation which Dr. Beveridge has suggested.

The second feature about this is that our relations with the Atlantic Regional Laboratory are quite formal. Money passes from the National Research Council to the university by terms of a contract. Staff at the Atlantic Regional Laboratory hold honorary appointments in the faculty of graduate studies at Dalhousie. They give classes. They supervise graduate students. The supervision of these students is normally done in the Atlantic Regional Laboratory using their facilities, and they pay the overhead.

We found that this works quite well. There have been occasional abrasions between the staffs of the two institutions but, by and large, both institutions feel that they benefit greatly from the association which we have.

The working arrangements, however, are maintained and nourished, if you like, through the man-to-man contact of the scientists at the working level. Without this I think the whole program would collapse. I would just say that I think it is important, if formal guidelines are to be laid down, formal agreements for such arrangements are to be set up, that the guidelines ought to be permissive ones rather than dictatorial ones which might lead one party or the other to think that something is being rammed down its throat.

Senator Phillips (Prince): Two more questions, if I may, Mr. Chairman. I would like to direct one to Dr. Loucks for two reasons. I happen to be a graduate of Prince of Wales and a member of the board of governors before we were legislated out of existence and I wouldn't want him to feel neglected here.

The Chairman: I hope this was not a precedent which will be applied to our own institution here.

Senator Phillips (Prince): I have heard rumours to that effect, senator.

You mentioned, to avoid duplication, that is that there should not be duplication of expensive equipment and so on, that there should be some form of assignment by a government agency. I wonder what would happen in a case such as this, Dr. Loucks, where universities from Prince Edward Island may make a request to do certain research work, say in fisheries, and the Science Minister or whatever government department comes out of this study says, "No, you should be more interested in another factor of the economy", say the potato industry. Now, what would happen in that case if a scientist is already interested in a certain project and it has been handled entirely differently?

Dr. Loucks: The situation I was thinking of was more if Dalhousie and the University of New Brunswick both at the same time decided they wanted to take on a particular research project and a decision would have to be made by the government agency between the two locations, assessing the personnel that they had, the facilities they have at the present time, and then deciding it will be done at one of those locations and not at both locations. That is the sort of duplication I think should be avoided.

As far as a specific project on fisheries or on the potato industry, I think that the location in Prince Edward Island should be able to take on that project because it has such a direct application that I think it should be given that project.

Senator Phillips (Prince): Thank you. I would ask the chairman not to turn his usual green colour when I broach this subject, and that is regional development. I would like to direct a question to the Reverend Dr. Clarke, because I think St. Francis Xavier has been a leader in this field, and

inquire as to why Atlantic provincial universities in particular do not take more of an active part in studying our regional development problems. This was a problem a few years ago.

Rev. Dr. Clarke: We have done some work on regional development. Historically there has been a lot of work done trying to get the farmers and fishermen into cooperation in cooperatives. The extension staff is working in the Cape Breton area very actively. They have been carrying on adult education programs. This is probably the key part of the situation, that you have to change a lot of attitudes in the people. You have a mining-steel group, and to get a change there you have to change quite a bit of their attitude. A lot of work has been done on this.

We have proposed regional development in certain fields. For example, we did propose two years ago the possibility of a research lab specializing in metals with the hope it would pick up the steel industry. There was no action on this, but we did propose it.

Senator Phillips (Prince): I am thinking too of Father Hogan who gave very valuable assistance at the time Dosco announced the closing of the steel mill and the expertise from the university was made available to the provincial government. I know he said it was appreciated and the provincial government found it of great assistance.

I would like to see more of that type of thing being done in the Atlantic universities. I might make the suggestion—I know I don't have to make it to you, sir—that the universities have been outstanding in that regard.

The Chairman: Senator Robichaud.

Senator Robichaud: Unfortunately or fortunately, the main questions I had in mind have been asked by my colleague, Senator Phillips, but may I mention in passing that I noted that, notwithstanding the fact that there does not seem to be a consensus of opinion or complete agreement in the Atlantic provinces regarding the amalgamation of the four provinces into one, this afternoon we have noticed that there is complete agreement, complete collaboration, and I might say almost complete coordination in fact, in this one particular aspect of the problem facing the Atlantic universities, that is that the federal government should become more

involved in support of universities, and this not only in the field of science but in other disciplines.

I hope, Mr. Chairman, that we will take this fact into consideration when we prepare our final report.

There is one question I had in mind which has been asked by Senator Phillips. It was the one mentioned by Dr. Beveridge when he stated that there was no medical schools in some provinces, and he referred to the assistance which the federal government was justified in giving in many circumstances regarding assistance to medical schools. I know the question has been asked regarding the specific support that the federal government should give in this regard, but also, before such support is given, and in order to justify the spending of federal money, is it not an important factor to be considered that, before making such grants, the government should consider the hospital facilities in the area, the availability of qualified personnel, qualified staff to teach in medicine, and also the population of the province?

If I were to express a personal opinion, I would rather see a high-class medical school, say, at Dalhousie, and then the University of New Brunswick to specialize in, say, engineering or forestry, and Memorial University to specialize in fisheries or other fields. I would like to have other opinions on this.

The Chairman: In other words, you want to have one big university for the Atlantic provinces with different schools or faculties in each province?

Senator Robichaud: Right. I think it is a mistake to have all the faculties in every university because I don't think that financially it is wise. I don't think it is practical. And I don't think we have the population or that we have the means to maintain that.

The Chairman: Let us see if we can have unanimity on this one?

Senator Robichaud: I doubt that we will, but I am just expressing a personal opinion.

Dr. Beveridge: Mr. Chairman, Senator Robichaud has certainly placed his finger on a number of relevant criteria that must be considered before going ahead with the establishment of a medical school. It is true that once one decides to go ahead, then there immedi-

ately come up a number of other faculties and schools that have to be considered as part and parcel of what might be called the health sciences approach to medicine. To buttress the work of the medical school one ought to have a school of pharmacy, let us say, a school of nursing, and so on. It is very often not just one facet of the school you are talking about, but a number of activities in education related to medicine. But it is quite true that certainly one has to consider the amount or the number of people in an area that are going to support or are needed to support a medical school before you go ahead with it.

I think probably Newfoundland is skating on rather thin ice with what, say, 600 or 700 thousand population in the whole of Newfoundland, something of that order, but I think, as far as staff is concerned, once you have the money and the facilities, and assuming...

Senator Robichaud: Money first.

Dr. Beveridge: ... assuming the geographical situation is not a factor, you can attract staff.

Dr. Burt: Mr. Chairman, there are just three points that come to mind in relation to Senator Robichaud's question. The first one is if we take the assumption that we should have this sort of macro university with different faculties in different places, then we are automatically denying the fact that we hope that the Atlantic provinces are going to grow. If we take the assumption that we are going to have growth in the Atlantic provinces, that we are going to have an increase in population, then you will eventually reach the stage where each of these different faculties is going to get so top-heavy, because they are not going to have the balance, and I think this is the second point I would like to make, that we must have the balance at the undergraduate level, and in order to attract good people to teach undergraduate courses, you have to have some facilities for these people in relation to research.

This brings up perhaps another problem altogether regarding the very place that universities have in modern society. We talk a lot about research but we must not forget—Dr. Beveridge pointed this out very well—we must not forget the point of teaching, and this point was made this morning also by Dr. Andrews.

Thirdly, in relation to the medical building particularly, the medical faculties, I think it

is extremely important to take an evolutionary viewpoint here by building up the life sciences complex particularly. I think it is only if you can get substantial departments of chemistry perhaps, organic chemistry, biochemistry, biology, zoology, it is only once you have this as a backup to the medical school that it becomes feasible on a university campus. We have to take into account obviously the hospital situation also.

Dr. Loucks: The only point I wanted to make has already been taken care of. If you are going to specialize you still require chemistry teachers and physics teachers. You cannot have medical doctors teaching in that area, so you are going to necessarily have various disciplines in your organization.

Senator Carter: And research in those as well as teaching.

Dr. Loucks: Yes.

The Chairman: Dr. Longval.

[Translation]

Dr. Longval: In reply to Senator Robichaud: the policy of the University of Moncton is to serve the French-speaking community of the Maritime region, and with your program, you are taking away the reason for the University's existence.

Senator Robichaud: In other words, you think the University of Moncton would be justified in having a faculty of medicine to serve two hundred thousand or so French-speaking residents of the province?

Dr. Longval: No. However, if you mean the Faculty of Medicine, I agree with you. But if you mean the problem in general—no.

Senator Robichaud: On the contrary. The problem in general, I agree completely.

Dr. Longval: Agreed. Thank you.

[English]

Dr. Langstroth: Mr. Chairman, on the question of the macro university, as Dr. Burt has dubbed it, it seems to me if you consider the situation that pertains to a growing university, perhaps a very small institution that grows slowly as opposed to some of the new places that seem to appear very rapidly, these start out with perhaps a faculty of arts and sciences or something pertaining to a discipline that one associates with a faculty of arts and sciences. It teaches undergraduates. And

as it becomes bigger it begins to do perhaps graduate studies, and then it starts to think about professional schools, law and medicine. These things are added on later.

Now, if the university is allowed to follow this pattern of growth, it will eventually go through various stages of increasing size and complexity. The problem is where you have, as we do, in the maritime region, some fourteen universities, some of which have already gone through several of the stages of increasing size and complexity, how do you conduct the process of adjustment which would be required to make the existing situation fit into the kind of institution you have suggested?

Senator Robichaud: Well, maybe I should add this; perhaps, as has been referred to so often in our discussions, the assistance to science should be based on a certain percentage of our Gross National Product. However, if, on the other hand, all the universities in the maritimes want to get involved in all faculties, what percentage of the Gross National Product would you get? I mean, they would only get bits and pieces and none of them would be effective. On the other hand, if there is a tendency for a certain university to specialize in certain fields, in certain disciplines, then they may get a worthwhile share of this amount being made available for assistance in the form of grants.

Dr. Langstroth: I think I agree with that point of view.

Senator Robichaud: I have another point. This is perhaps a touchy one and I don't know whether I should bring it up or not. Reference has been made to certain occasions when special economic studies, for example, are made, and reference has been made to the Atlantic provinces, and experts have been brought in from foreign countries.

The Chairman: Or foreign provinces.

Senator Robichaud: Or foreign provinces, that's right. I noted with interest, for example, in looking at the brief of the faculty of science of the University of New Brunswick, there are four names mentioned, Dr. Burt, Dr. Pajari, Dr. Unger and Dr. Young. Dr. Burt, I understand, is from Ceylon, although he is a graduate of the University of New Brunswick. Dr. Pajari is from the Province of Quebec. Dr. Unger is from Poland. And Dr. Young is from Northern Ireland. I am sure

that the University of New Brunswick has benefitted from the knowledge and know-how of these professors.

The Chairman: What has become of the traditional export of brains from the maritimes? It is the reverse now.

Senator Robichaud: I notice that the maritimes is really importing brains instead of exporting them, particularly to the west coast, as we have been saying so often. The question I want to ask is this, and I would like comments on it: Are we making progress in preparing our own students to take charge or participate in teaching or specializing in certain faculties?

I may say in passing that some of the Atlantic province universities—and I cite the University of Moncton as an example have had most unfortunate experiences in individual cases, where in some cases teachers have been brought in from foreign countries without having, I won't say any information whatsoever on the past histories of those teachers, but having very little information. I had the experience last year when I was visiting a certain part of France where I was approached by people from the government and representatives of universities asking how we could have accepted particular individuals in Canadian schools, and I was given the names of two or three teachers. They said, "Here we call them "indésirables" and then you welcome them in your universities." Could I have a comment on that?

[Translation]

Perhaps Dr. Longval could tell us something about it?

Dr. Longval: I wish I could say that when I left Moncton, the Rector did not ask me to speak on his behalf.

The Chairman: He is one of the former students?

Dr. Longval: Yes. However, regarding the problem you mentioned—I am not yet sufficiently well versed in the administration of the University to be fully informed. So I think that if I gave you an answer, I would be putting my foot in it—or it would not be recognized.

[English]

The Chairman: But what about the brain drain? Is it as bad as it was or is there any improvement in the maritimes?

Dr. Burt: I wonder if I might ask permission to have one of my colleagues answer this question, one who has some experience in this regard?

The Chairman: Yes.

Dr. Burt: Dr. Unger has done some research on this.

Dr. I. Unger, Assistant Professor of Chemistry, University of New Brunswick, Fredericton, New Brunswick: I actually did my graduate work in New Brunswick, Mr. Chairman. I went to the United States to do some postdoctoral work and then returned to the faculty of science of the University of New Brunswick. I think that throughout the maritimes we have quite a few individuals who have done their undergraduate work and perhaps graduate work at various maritime universities, have gone to the United States and other parts of Canada and the United Kingdom for further studies and experience, and have returned to the maritimes. It seems to be a sort of phenomenon in the maritimes that once you have been there you sort of like to go back.

If I can take this opportunity I would like to support Senator Robichaud's views on the subject of the large number of universities which we have in the maritimes. Now, this is perhaps an historical affair, that we have these fourteen institutions. I think that most of us are aware that this is not desirable because we have too many small institutions with inadequate facilities. I think perhaps some of the cooperation that was mentioned before, which does work very well, is because we have realized that individually we cannot do as much as we can with cooperation.

There are many facets of cooperation that I would like to mention. For instance, the fisheries group at St. Andrew's use the computer facilities at the University of New Brunswick. There is cooperative use of the glass-blower at the physics department at the University of New Brunswick. At the same time the APICS, which was alluded to before, has made a list of all the major equipment available at various maritime universities, which these same universities have said they would be willing to make available. We have been made a list of educational films which are to be made available at various institutions, which institutions have agreed to loan them out to each other.

The Chairman: Thank you very much. I know that Dr. Beveridge has to go now, but before he goes, on behalf of the committee, I would like to thank him very much for having attended this meeting and helping us this afternoon.

Senator Kinnear: Mr. Chairman, I have a supplementary question to Senator Robichaud's. When this committee was at MIT we were speaking to some of the faculty and they said that Canadians studying there, Canadians who wanted to come back and teach here, could not find employment. I wondered if any of the university representatives had had applications and had to refuse them?

The Chairman: Too many Americans already in Canada?

Senator Kinnear: Yes, too many of something.

[Translation]

Dr. Longval: While reviewing the files of this year's candidates, I found one in this category, and got in touch with him. He is working in the United States. He was asked whether he was interested in coming to work here in New Brunswick; in reply, he said that he was not, since his salary in the United States was higher than what we could offer him here.

[English]

The Chairman: Any other comments?

Senator Kinnear: I think they say now that the salaries are even, that there is not too much of a gap in salaries.

The Chairman: I know that Dr. Laird wanted to speak. I will come back to the others.

Dr. Laird: Mr. Chairman, I am going to have to go back to Senator Robichaud's first question, but I would like to say that the arguments for a second medical school in the Atlantic provinces have already been made and in fact this particular battle has been won some time ago and the first group of medical undergraduates are entering the new medical school at Memorial this September.

Just as a general observation, on the question of a medical school in Newfoundland, I would like to recollect what I said earlier about the isolation of the province. Newfoundland is really a whole lot further away than an hour's flight to Halifax on a good day. And its 600,000 people are scattered

thinly over a pretty large area. A high percentage of them have lived in a state of poverty or near poverty for a long period of time, and the types of public health problems and of disease problems are rather unique. For example, there are few parts of North America where one would find so many people living with a well, no sanitation, and a disturbingly high rate of hepatitis. There are all kinds of problems that are not being solved with matters as they stand. We would hope to see them solved that much more quickly with the stimulus of the medical school which we now have in our midst.

As far as fisheries research is concerned, I would like to make one observation. Quite clearly, because of the type of facilities now available at the Marine Sciences Research Laboratory, we have a magnificent opportunity to become involved in types of study which demand very clean sea water and which demand circulating sea water available all the year round, and that is appropriate to a university rather than to a government agency. We see ourselves increasingly participating in close collaboration with, for example, FRB in types of problems that are crying out for answers right on our own doorstep. And not just in the fisheries field. One of the marine science-related problems we have is that of marine pollution. For many, many years past ships passing by Newfoundland have cleaned out their oil tanks, and the oil has come ashore on the southern shore where not very many people live. In fact, it has been something of the magnitude of a continuing Torre Canyon disaster going on, simply because it is in an area where not really too much attention is paid to it.

We do see as really one of our great research challenges the possibility of becoming very heavily involved in pollution-related research at the national level because we can furnish habitats that are still essentially uncontaminated over a very large variety of types. We have clean water, we have much more clean, fresh water than is available...

Senator Robichaud: Unless a tanker happens to go by.

Dr. Laird: Yes. I am keeping out of that. Our long-term research program is calling for, at this stage, the beginning of work on base line data on selected areas not yet substantially interfered with by human activity at all. So that as new industries are brought in it becomes possible to monitor much more

meaningfully what does happen through industrial pollution through knowing what the situation was like in the first place.

In other parts of the world where pollution has become a serious problem it has already proved too late to get relevant base line data against which the impact of man-made contamination could be monitored. We see ourselves in an exceptionally good situation, again disregarding individual instances of pollution bound up with present industrial ventures.

We see ourselves in a wonderful situation for assuming quite a significant role in pollution-related studies not just in the marine environment but across the whole spectrum of what is coming to be referred to as environmental biology.

So I think it might be perhaps temptingly easy to pick on one or two or three, at first sight, very suitable roles for a particular university to play which in actual fact would cause one to miss perhaps basically more important issues that demand a well-rounded university rather than a university highlighting certain study areas.

Senator Robichaud: Has it reached the stage where it is now the only university in a position to give major degrees in fisheries?

Dr. Laird: We do not give degrees in fisheries as such but we do give degrees in marine-related aspects of biology, and in increasing numbers. On the other coast, UBC has an institute of oceanography and a rather similar pattern.

The Chairman: Any further comments?

Dr. Keen: A comment on the nationality aspect, Mr. Chairman. It seems to me that as of nine or ten years ago if you wanted to establish graduate studies in a field in which there was not strong Canadian participation you had no option at that time but to go outside. I would say the pattern is changing. By and large now it is possible to get mainly Canadian men trained in these fields and there is much less demand for foreigners to staff our universities in various specialized fields, whereas just ten years ago if you had said, "No foreigners" then it would not have been possible to staff them, say in marine sciences or other aspects of geology, for instance. Canadian trained people in these fields did not exist.

Senator Robichaud: You understand we are not complaining about the situation.

Dr. Keen: Why not complain?

The Chairman: It is much better to have this kind of movement than the other.

Dr. Bridgeo: I would like to make a comment with regard to the senator's remarks about the number of institutions. At the first international college and university conference or exposition in January, 1969, in Europe, it was pointed out that there is an institution of higher learning being created every week in the United States. The percentage of high school students going on to university in the United States, I think, is about 30 per cent. In the Atlantic region it is around 12 per cent. A desirable sized sociological unit, if you want, for an institution is around 2,500 to 3,000. I would suggest to you that all of these institutions we are talking about are coming on to that size very rapidly and the problem is really going to be how to control their size, I suspect, rather than try to consolidate them.

If you consider the problem up to a certain cut-off point, that all institutions that exist should have certain facilities, and the cut-off point, I suggest, as the bachelor's degree or the undergraduate honours degree, then beyond that point I should not speak because we are not very heavily involved. Those that have graduate schools have spoken this afternoon but I can see where really heavy expenditures are involved there and considerations such as the ones raised should at least be aired.

The Chairman: I know that Senator Blois from Nova Scotia is very much interested in universities in his province and in the Atlantic provinces generally. Although he knows most of the answers, does he have a question this afternoon?

Senator Blois: Mr. Chairman, I don't know many of the answers.

Senator Haig: That is true.

Senator Blois: I will admit it. Some of my friends from western Canada won't. That is the difference. I am sorry that Dr. Holbrook and Dr. Beveridge had to leave as I had questions I might have asked of them. However, I would like to say this, that I have in the last few years kept quite closely in

touch with the universities of the maritime provinces, particularly those from my own province of Nova Scotia. I am very proud of the fact that in quite recent years the universities have been working very closely with industry. They are doing a lot of work, perhaps uncalled-for work, that they are really not getting paid for. They have been working for the last, say, ten or fifteen years closely with the Nova Scotia Research Foundation and some of the results they have been getting from the research have been really wonderful. Many of these men now are getting so busy at their own universities they have not the time to carry on what they have been doing in the past. The research foundation is endeavouring to set up its own staff.

In the work that has been done at Dalhousie and many of our other Nova Scotia institutions they have worked very closely with various industries, particularly in agriculture and fisheries. And it is the people at the grass roots level who are realizing and getting great benefit from this work.

Something has been said here this afternoon about keeping them there. I am very proud again that Nova Scotia has turned out some very fine science engineers. Some of them go away. Most of them have gone away for postgraduate work, either to the United States or Europe or in some instances to some other place, but they have for the most part come back. However, we have sent out a lot of very able scientists, who hold very good positions in various parts of Canada and the United States.

I feel confident that the things that have been brought forth by these men today are very worthwhile. I am hoping that we will have some additional money to carry on the wonderful work that these universities have been doing.

My friend, Senator Haig, to my right, who always wants to give me a dig, said, "Apparently you people in Nova Scotia can do anything if the money is available". I told him, "Yes, and perhaps a little better than in any other part of Canada." I sincerely believe that, on the record of what we have turned out.

The Chairman: We will leave you with your colleague from Manitoba to decide that.

Senator Haig: There is a remark here made in the brief of Acadia University to this

effect; "The prime function of the university is then to educate young men and women; secondly, its staff members should carry on research in order to advance knowledge; thirdly, an appropriate liaison should be formed with industry and with those departments of government mainly involved in applied research and development in order to hasten and ensure the application of fundamental advances. It is a belief shared by many that this liaison ought to be improved."

May I ask any member of the panel how that can be done?

Dr. Burt: Mr. chairman, one way that my colleagues and I did consider could improve this liaison, and we were talking about this considerably last night because so much of this comes down to straight communication between governments, between industries, and between universities, is by opening up conferences on a national basis in the different areas that are of interest to each of the different units, by opening these up and having invited speakers and having workshop sessions.

I was privileged recently to attend a CIPA (?) conference in Toronto about the beginning of this year thinking that here was a chance—you yourself were there, Mr. Chairman—that here was a chance where one could get all these different viewpoints together, but in fact all the different viewpoints did not come together. It was mainly university and government viewpoints that came together; industry was very poorly represented.

Senator Haig: Why?

Dr. Burt: Ask industry, sir. Don't ask me. I don't know.

The Chairman: It was more of an open conference. Everybody could attend, I think. It was not upon invitation. Senator Grosart was there too.

Senator Haig: We have heard today that certain smaller industries have not the financial means to have research departments. Couldn't the universities do something in helping these smaller industries in research problems on a contract basis? You see, in the United States we have found that some of these universities, like Harvard and MIT, do a lot of contract work for the government. Industry presents a problem to them and they

work it out on a contract basis and find a solution. As a result industry is saved and the university or the technical school has a possible use of proven research facilities. Why could that not happen in Canada?

Dr. Bridgeo: I would like to comment to this effect, I have been associated with the Nova Scotia Research Foundation, to which Senator Blois referred. I have been wearing two hats as director of the chemistry division of that foundation as well as carrying on my regular university duties. As Senator Bois has pointed out, the duties are becoming a little heavy, and as a result I am trying to sort them out and am clinging to the university side. However, over the past ten years I have had a lot of experience in working with small industries and have found it was not a simple matter. The communications problem mentioned here a moment ago is paramount. The man in the university very often does not have an appreciation of the problems of the man in the plant. He has to be a certain breed of cat, if I may speak loosely. So I think there is a big problem here in the matter of changing attitudes.

If I had a chance to say only one word here this afternoon I would say what Father Clarke said a moment ago, that it is an educational problem. I do not think it is easy. You can search out people who have the interest and if you give them the opportunity, and these are some things I mentioned in my brief, get rid of some of the roadblocks, it can be done, but you are searching for a certain type of person, not just any university professor. And I suggest also that in rearranging your priorities in science in the country this is one of the big "people" problems you are going to run into, taking men who have worked on pure research for a long time and then trying to get them to work on real applied problems of research. There is a big change in attitude that is necessary.

Senator Haig: Then they have to be educated.

Dr. Bridgeo: Yes.

The Chairman: Dr. Longval.

[Translation]

Dr. Longval: I spent yesterday and this morning at the University of Ottawa, attending the conference of engineering department heads from Canadian universities. The direc-

tor of industrial research at McMaster University was there, and he emphasized the fact that industry is reluctant to sponsor university work.

This morning, it was suggested that the problem should be studied more thoroughly, in order to arrive at a solution.

In my opinion, the gap between the universities and industry is not created by university staff, but rather by industry's refusal to get involved in internal university affairs.

[English]

Dr. Keen: I think there has been another comment which is important, perhaps only to your committee, sir, and that is in connection with the research which is undertaken by industry in Canada or the lack of research which is undertaken by industry in Canada because of foreign domination. You find, for example, that a major oil company based in Calgary—excuse me, with a subsidiary office in Calgary—will close down its computer centre in Calgary and go on direct cable into Tulsa, and once its computer centre is gone the employment office for all Canadian graduates will be located in Tulsa or Houston or wherever. This is of concern to me, involving as it does graduate students directly and the employment of graduate students directly. It seems to me this is a problem which the country must face.

If you are an Englishman working in England and you want to work in a Shell lab, you may, or if you are a Dutchman or an American, but if you are a Canadian geologist, and in this I may be quite wrong but I doubt that you would be able to work in a Shell research lab; you would have to be in an exploration office. It seems to me to be a very important point from the point of view of subsequent employment of our graduates.

Dr. Laird: I wonder, Mr. Chairman, if I could cite a specific example. In the area of pollution-related biology I would suspect that there would be a tremendous future for government-industrial-university collaboration. This is an area which tends to arouse the emotions rather rapidly. A lady in Washington who belongs to the Audubon Society and finds a dead robin on the front lawn and known it has died eating DDT-carrying worms, gets very worked up about it, forgetting that the same DDT has been saving very large numbers of lives in other parts of the world where it was the only way of getting rid of insect-borne diseases.

As industry becomes more sophisticated and introduces more and more sophisticated compounds, the by-products of the plastics industry, for example, into waterways there are bound to be yet more complex pollution problems arising, each of which has a very emotional component.

Senator Haig: In five years time they find out what the side results of these new things are.

Dr. Laird: Exactly. My point is that it is possible at the planning stage for industry to provide the money that might otherwise later have to be paid out by way of reimbursement and all the rest of it, to put such money into university research designed to evaluate the effect of particular contaminants on eco-systems, and this might lead to a much happier situation all round and to the promotion of much more effective interrelationships between the three components of government, industry and the university, and a much greater understanding of one another.

Senator Haig: Mr. Chairman, you have allowed Senator Robichaud to embark on a subject which might be controversial. Let's take a specific example, that of placenta Bay.

The Chairman: I certainly hope that controversy is not out of order here.

Senator Haig: Thank you, Mr. Chairman. Before that industry was located there was there no research done as to what the effect of the effluent would be? And, if not, why not?

Dr. Laird: If you are asking me that, I can take refuge in the fact that all of that happened before my arrival in Newfoundland and I am unfamiliar with the politico-legal background.

Senator Haig: Let's assume that this industry was to be established there and it had a certain process. From that process resulted an effluent. That was, they say, what caused the problem with the fish in that bay. Before that industry was established should not there have been some research done by either industry or the university there or the Fisheries Research Board or some organization to find out what the effect of a certain percentage of that effluent would be?

Dr. Laird: My answer to that would be an unqualified yes.

Senator Haig: That's what I wanted, thank you, Mr. Chairman.

Senator Carter: I want to get in a plug for Newfoundland in a minute. However, first I want to ask anybody this question: How are we doing in the maritimes as compared with the rest of Canada in producing scholars, in producing PhD's? Is anybody doing research into that? And what is happening to the PhD's we produce? Are they part of the brain drain? Do they go to other parts of Canada and the United States? Does anybody know the answer?

Dr. Langstroth: First, let me say that I don't know the answer to the question as to where do the PhD people go.

Senator Carter: How do we compare, first? We were talking this morning about the fact that we are getting the small end of the stick with respect to graduates, some 3 per cent or 6 per cent. How are we doing anyway?

Dr. Langstroth: Well, it is an uphill struggle to establish graduate schools to the PhD level. They are fairly new in the maritime provinces. I speak for my own school. Dr. Burt speaks for UNB. It is expensive. It is time-consuming. It requires highly skilled specialized staff. We are now beginning to produce output, students are graduating. Some of them stay around. We know that. What happens to the majority of them is something we would like to know and we are setting up machinery to try to keep track of them but I cannot answer the question today.

I suppose it takes at least three years to produce a PhD from the bachelor's degree level. It is more commonly four or five years. At Dalhousie University, in many disciplines, doctoral studies have only been approved in the last three or four years, so it is a little too early to begin to compare our output per unit of whatever input you use with universities in the other parts of Canada.

We now have fifteen disciplines in which we offer the PhD degree. We have lots of students wanting to get into the programs in each of these disciplines, and we take that as a good sign. We think we have good students and we are sure, when these people obtain their degrees, they will be well-qualified and will compare very favourably with the products of the other universities in the rest of Canada and elsewhere in the world.

Senator Carter: The general theme this morning was that the maritimes were not getting a fair share or proportionate share of grants, of the total federal funds, allotted for research, that maybe we are only getting about half our share, somewhere between half and maybe three-quarters.

If we got more money, if our grant was doubled, what would we do with it? Do we have projects now that are not being developed at all that we just sweep under the rug? I would like to know what is being left undone. I am not thinking about individual students and individual projects where any person can have a good idea and he might go and explore it. That is all very well. But I am thinking of projects, things that you have already started and cannot finish or where you had to curtail your research, that sort of thing. Is that sort of thing going on? Can you give us examples of it?

Dr. Laird: Well, yes, I believe, Senator Carter, in this same area at Memorial we are fortunate in having in the biology faculty three people all of whom have rather senior standing in their particular discipline, not only on a national but at the international level. The man who is setting up our environmental biology centre directed Berkeley's Centre of Environmental Biology before we managed to lure him into St. John's.

However, we are in the rather embarrassing situation at this moment of not having the space to house equipment and non-academic personnel, which and who could be used to build up a really strong program in this field because before qualifying for a federal negotiated grant the university, as its input, would have to provide space or show it had the space available into which the equipment and other personnel could be moved.

At the present time, simply because no space whatsoever is available, it is not possible for us to back up these good personnel with the sort of equipment they need, and I believe we are running a very real risk, if this is carried on for too long, of some people beginning to lose interest in remaining because they were attracted by the thought of the kind of projects that they could enter into at the site and now find they are not getting the sort of equipment they need to be able to carry out studies that would be relevant to things like the Placenta Bay situation that was mentioned.

Senator Carter: Do you think funds for that should be included in research or should that come under a separate heading, that is funds for accommodation? I can see you run the risk of losing professional talent that you have assembled simply because you have not the funds to provide the equipment and space for them to work. Is that a legitimate charge against the funds to science research? Should that come under another heading?

Dr. Laird: I believe that the prevailing feeling at Memorial is that our special situation does make a case for a measure of capital support that could let us get over this hurdle and into the area of obtaining the kind of support for our research that we would qualify for, having the space. Perhaps it is a special case. Perhaps it is something that is not going to last for very long. However, this is the time when we need the money for capital costs that we haven't got. Perhaps in three or four years time the same money would be of little use from the personnel standpoint.

Senator Carter: I will give you an idea about that after I have heard some of the others.

Dr. Burt: Mr. Chairman, there are one or two points that do come to mind here. Specifically the development of programs in relation to graduate programs is always geared very closely in most science departments to grants from bodies such as the National Research Council, and where these grants are being cut back proportionately, for instance, I think you, Mr. Chairman, made the point this morning that once you are on the list you stay on the list; this is not so any more. It may have been true once. Now it is certainly no longer true. We have many people in our own department within the university, for instance, whose productivity researchwise has not been sufficiently competitive and they have been cut completely.

The Chairman: Well, this assertion was made to us by the Macdonald group last week.

Mr. Burt: I see. Well, I am giving you actual instances in this case. However, we are greatly dependent on these grants. Otherwise we cannot support graduate students. Much of the graduate student's salary at the moment has to be paid out of the research grants which an individual professor gets and if he

is shaky about the amount of money that is going to be promised the following year he will hesitate to commit himself to a program which perhaps can expand at the time because he will say, "Well, perhaps they are not going to give me quite as much." Either that or he goes ahead, finds he has the students but has no money.

The other point, again a specific example here in relation to the University of New Brunswick, concerns the negotiated development grants that were mentioned this morning relating to NRC once more. Here we have a situation at UNB where the chemistry department is extremely strong in relation to natural products, the chemistry and synthesis of natural products. Professor Wiesner for instance, at UNB, who has very recently been made a Fellow of the Royal Society, has tried for two or three years now, I think, to establish an institute. The university supported this grant. This was turned down. NRC did not have sufficient federal funds available to give this negotiated grant. And yet they are just waiting to go.

ADB, as it was before the recent modifications, gave a fair amount of money to help as to the building, so we have the space, but again it is the lack of this negotiated development grant to get the equipment that is holding matters up. So I think there is very clear evidence here that this program could go ahead in the Atlantic provinces without question, given sufficient federal support through NRC.

The Chairman: Any other comments?

Dr. Keen: Two comments. First, in terms of funding to universities, particularly by comparison with the other agencies, that is totally inadequate. If you gave the chairman of the science department at Dalhousie University \$300,000, he would spend it this afternoon. They would work on three items that we are discussing ways and means of attempting to acquire somehow. It is a matter of inadequate funding. That is the first point.

Secondly, I think inadequate methods of budgeting for graduate work in general prevail. If you are, say, the chairman of an undergraduate department of a university you have a regular university budget and you submit it to the president and in due time, usually late but in due time, it comes back and you know approximately the same

amount of money—or more, hopefully—will come back the next year, and you keep putting forward your budget keeping in your mind this thought, "We will put this much this year and add to it next year." On the other hand, budgets for graduate schools, dependent as they are largely upon National Research Council monies in the case of the sciences, they are put on an ad hoc year to year basis, and I personally find it very difficult to think of budgeting with a sort of five-year thought in my head in my own undergraduate department. I find this most difficult.

The Chairman: Yes, Dr. Langstroth.

Dr. Langstroth: I would underline what Dr. Keen has said and I think the approach that is taken is to cut the coat from the cloth that is available. Dr. Keen has mentioned three items of the order of \$300,000. These are not exotic things, these are basic research tools that anybody in the business doing work in the department concerned should really have at their disposal. Not only does Dalhousie not have them, but Dalhousie does not have access to them elsewhere. It means that research has to be done without the use of these basic tools. It is a hard thing to do.

The other comment I might make is that we are planning at Dalhousie to open a life sciences complex. I believe Dr. Laird has made reference to the Aquatron connected with this part of the university establishment. The Aquatron will be a running sea water facility in the life sciences complex which will house both undergraduate and graduate facilities for teaching research in oceanography, biology and experimental psychology. The experimental psychology will largely be done with sea animals. Building costs are estimated at something of the order of \$18 million. We think we can get the building up and opened by late 1970.

If you consider an \$18 million building and then consider the simple basic scientific instruments, not the exotic special things but the everyday tools of the trade that need to go into an \$18 million building, which is perhaps devoted half and half to research and teaching, or perhaps a little less than that to research, it comes out to a big bill. We are going to be hard-pressed to find that equipment in order to make full use of our building when it is ready.

Dr. Bridgeo: Our geology department is interested in research in natural resources in

the Province of Nova Scotia. The geologists normally take field trips. It is conceivable that the young chaps could go out and over a period of time could—not with the same expediency or despatch as a commercial company—could outline mineral deposits. The chemists in the university are interested in extraction. Now certain experiments in the training of the chemists can be designed around the extraction process so that instead of analyzing something that means nothing they could be getting, over a period of time, a set of data which we can discuss and relate to a resource in the province. In addition to that, the product can be used as the raw material for, say, a polymer. Several students can be put on studies, not publishable because this is training, but studies which are precursors to the final polymer. In addition to that, the final polymer should have properties which will make it desirable as a protective coating for marine atmospheres.

What I am getting at is that through this cooperative effort in the various departments, bringing in student experimenters and a certain number of students on a more concentrated basis, I think you can get across to students while they are studying what is really involved in the total concept of an idea through to a commercial fact. Then when these people get out in the world and become councilmen or MPs or whatever, they are going to be faced with making decisions, and I think this experience will help them know what science is all about in this period we are about to enter.

Finally, if I may make one comment as to our own specific case, to help that along, since you ask what would we do, we would immediately hire a certain number of full-time technicians to enable us to have the continuity. I think we should look at those people as skilled people being provided with jobs in this area. And I can refer to this, if you want, as the "knowledge" industry. I referred to this in my brief and said it was related to the dissemination and application of knowledge.

Again, at that same meeting in New York I mentioned before, it was stated by a representative of a financial house that by the end of this century 50% of the Gross National Product of the United States of America will come from the knowledge industry. To me, that is quite an expressive figure. So I suggest that we should consider some of this staff that the universities would

hire really as being people that would be employed by industry.

Senator Carter: Sort of an industry in itself?

Dr. Bridgeo: Yes.

Senator Carter: One final question, since it is getting late. I would like to come back to the marine sciences project that Dr. Laird outlined for us. It embraces a number of disciplines. When we were down in Washington we were told that down there they are beginning to get worried about the effects of some products. We were talking about DDT a moment ago. They were beginning to get worried about the effects of new products or new chemicals which come on the scene and appear to be a blessing at first and then after five or six, seven or eight years, we begin to wonder because we see the other side, the disadvantages. They are thinking in terms of trying to forestall this as much as possible, trying to forecast the probable effects of new substances and that sort of thing.

Dr. Laird pointed out, I think, that in Newfoundland we have pure salt water and polluted salt water, unpolluted and polluted fresh water, and...

The Chairman: A pluralistic society.

Senator Carter: Yes. We have all the ingredients there to have the base line studies that this type of research needs. I just wondered is that included as a part of your program?

Dr. Laird: Yes, it is.

Senator Carter: Well, that would be on a national scale, I would think, which might justify you in asking for a little money.

Some Hon. Senators: Oh, oh.

Senator Grosart: Mr. Chairman, I think we should pursue a little further...

The Chairman: Would it be agreeable if we go on until six o'clock?

Some Hon. Senators: Yes.

Senator Grosart: Mr. Chairman, as I was saying, I think we should pursue further this question of the percentage of total federal funding of NRC by regions. The figures we were given indicated that at least in the grants area the percentage vis-a-vis population in the maritimes appeared to be very low. No one would argue, I suppose, that the

total funding should be on an exact basis of population, but, on the other hand, this is one of the ways of getting at the total amount that a national science policy should determine as necessary to meet the needs of the public goals of Canada that can be accomplished through research and development. It can work both ways, of course.

Another point that comes from that is the emphasis that arises from funding of post-graduate research only. Dr. Laird and Dr. Loucks both emphasized the importance of funding of such graduate research. I wonder if we could have an idea of the total federal funds that go into undergraduate research? How much of the total now finds its way into undergraduate facilities?

Dr. Loucks: I would think it is a low fraction. You have to get your young man to do the research. Then you might have to hire a summer student for the summer. You would like to have a full-time technician who can give you results through the entire year. APICS provides summer students along this line, but NRC money that would be used in the maritimes now, that finds its way into the hands of undergraduates students, would be a very low percentage. I think it could be much higher.

Senator Carter was asking the question, how could we use more money? I think we could use it effectively by hiring our students in the summer months to conduct research. Sometimes they cannot do the work because they do not have the full qualification, the undergraduate, but they can do some work for you in the summer months.

Senator Grosart: There has also been raised the merit criterion for research. We have heard it said over and over again that all research funds should be directed to researchers of very great merit. This seems to me to be nonsense. Surely we have to develop merit, and particularly in an area such as this. Surely if you are only going to support merit, you are not going to have very much merit before long. Would anybody like to comment on that?

Dr. Burt: Mr. Chairman, I would like to comment on that because it has been the policy of NRC to provide people starting out with a certain amount and to see whether or not they can prove themselves with that amount, and if they can prove themselves, if they do show that they have sufficient merit, then

they will continue with it. I think this is a perfectly sound policy. I think this in effect is the answer. I cannot say any more than that.

The Chairman: But that system would produce, at least if we compare figures on the basis of population, it will produce regional inequalities.

Dr. Burt: No.

The Chairman: Well, the figures we were given by Dr. Beveridge this afternoon would seem to indicate that.

Senator Grosart: I think I would say that would only mean there has been too much emphasis on merit on the assumption that no good can come automatically. In other words, there is the concentration of funds in Upper Canada and such places, where there is an assumption that this is the place where all the merit lies.

Dr. Langstroth: I assume we are in this connection talking about merit as it attaches to the individual?

Senator Grosart: Or to the project or program.

Senator Carter: It attaches to all three.

Dr. Langstroth: I think there is need for support for meritorious projects. The young man who has a very brilliant idea and submits his idea for the scrutiny of an eminent panel which may attest to the brilliance of his idea may find it costs \$50,000 to get the project underway, and with present granting policies he will have great difficulty in being able to make a start. That is my view.

As to your previous question as to how much of the research money gets into the teaching of undergraduate students, I think it is a difficult question to answer. First of all the money which goes by fiscal transfer from Ottawa to the provinces eventually ends up in the universities and a great deal of that is used in the teaching of undergraduates and such research as may be attached to that teaching.

The money which goes in the form of research grants to individuals surprisingly enough in some institutions also ends up in the undergraduate teaching program because the people doing the research are fairly generous with their apparatus on some occasions. If they happen to have a piece of equipment

which is a useful teaching tool and the university cannot afford to buy one for the undergraduate lab, quite often they will lend it for an afternoon or a week. So to that extent there is an application to undergraduate teaching. As to a precise evaluation, I would hate to evaluate how large the effect is in our own university and, of course, I don't know about the others.

Senator Grosart: Since we are mostly concerned with a national science policy in this committee, there does seem to be an assumption that one solution of the constitutional question as to federal invasion of the educational field is that the whole funding from the federal public purse should be to the post-graduate level. As an element of national science policy would you think that is sound?

Dr. Bridgeo: Well, I tried to point out the need, and I think Dr. Beveridge also made a strong plea, for support for the undergraduate programs, because, after all, these are the feeders. You see, if we do not find these people we are not going to have anybody in graduate school. I will not talk about my own case, I will talk about a neighbouring university, Acadia. Professor McGarry has been extremely successful in his physics program. I know that over the past several years he has developed students to the honours level who have been in strong demand at the best graduate schools on the continent. In one case the chap was offered \$8,000 a year to go to a graduate school of his choice, and all he had to do was to work for the sponsor. It so happened that the sponsor was the strongest institution in his particular field of physics, so there was no problem there. This just goes to show that if this man had not been working with these students over the past several years we may have lost, I don't know perhaps six to ten very valuable people. And, of course, once you get a valuable man, as you all know, his influence spreads very appreciably after he is fully developed.

The Chairman: I would like to go around the table now—not to you, Dr. Burt, because you have already expressed your view on this subject—and ask for your opinions about the recommendation made by the Macdonald group that the granting function of NRC should be separated from the lab. You have said, Dr. Burt, you are against this. I wonder if the others here around the table would express some views about that proposal?

Rev. Dr. Clarke: I believe they have already made a separation of sorts. The present system seems to be the one that our group favours.

Dr. Langstroth: I would agree with that.

The Chairman: So there would be more or less unanimous opposition to that particular recommendation of the Macdonald group.

Dr. Keen: May I ask, sir, what difference it would make? It is just either an administrative or bookkeeping thing. Would you call it NRC Section A and Section B or Council X and Council Y? The lab functions do not seem to overlap with the functions of the granting agency.

Dr. Langstroth: I would make this additional comment, if there is separation, in view of fitting the research money into the overall scheme of things in the country, that other disciplines, if you want, even humanities, be represented on the board because there are some people in the humanities who are quite knowledgeable on scientific things.

The Chairman: Well, thank you very much for spending this afternoon with us. We hope that as many of you as possible will be able to stay on in Ottawa for our plenary session next Thursday afternoon. We hope at that time that there will be some people from the Macdonald group present as well, so we will be able to have a full meeting.

The meeting adjourned.

APPENDIX 61

BRIEF
TO THE SPECIAL COMMITTEE ON SCIENCE POLICY
OF THE SENATE OF CANADA
BY
THE FACULTY OF SCIENCE
SAINT FRANCIS XAVIER UNIVERSITY

General Policy

We believe that as a cornerstone of its science policy, Canada should assign to Research and Development the same proportion of its Gross National Product as do other industrial nations. Some of the many reasons that may be given to support such a policy would be:

(a) It is expected that a sufficient number of young Canadians have the inclination and talents to perform such work, and if the opportunity is not offered to them to do so here, they will continue to emigrate. The loss of scientific and technical personnel deprives the country of many employment opportunities associated with such competent people.

(b) The technical information that would accrue is an exportable commodity, e. g. patent licencing.

(c) We have an obligation to play our part in the universal search for a better life that is gained from increases in knowledge and technology.

Regional Policy

We believe that the funds expended by the Federal Government in carrying out this Research and Development program should be distributed with due regard to the social impact on various regions of the country. This viewpoint has been succinctly stated by Harry G. Johnson:

THE GEOGRAPHICAL DISTRIBUTION OF SUPPORT
OF BASIC SCIENCE

In conclusion, it seems desirable to draw attention to a facet of policy toward basic science that is important but tends to be overlooked by scientists. This is the implication of the geographical distribution of science support for the pattern of growth of the U. S. economy. The location of scientific research activity in a particular city or region generally constitutes a focal point for the development of science-intensive industries in the surrounding area, and this should be taken into account in deciding on the location of such scientific activity. There is a natural tendency for scientific activity to agglomerate around established centers of scientific accomplishment; and this is probably the most efficient way of conducting scientific research from the point of view of science itself. From the economic and social point of view, however, and perhaps even from the longer run scientific point of view, there is a strong case for encouraging the development of scientific research centers in the more depressed and lower income sections of the country, as a means of raising the economic and social level of the population in those sections. Much of the poverty problem is associated with geographical concentration

of high-income industries in certain areas and their absence from others, which makes migration the only feasible route to economic improvement. A deliberate policy of locating scientific research in the backward areas of the country to encourage their industrial development could in the long run provide a socially and economically more attractive attack on the poverty problem than many of the policies now applied or considered.

This point, it should be emphasized, is independent of whether the Nation is spending too little or too much on the support of basic research, that is, of whether the beneficial effects described are worth their cost. So long as public funds are allocated to the support of basic research, the geographical allocation of the funds should take account¹ of the social effects of their expenditure.

Role of the Universities

We believe that the Universities should be responsible for the greater part of the fundamental research that is basic to all Research and Development and also for a substantial amount of the applied research that flows from it. It is acknowledged that the development work should be done by industry.

We have in Canada the anomaly that many of our industries are subsidiaries of foreign companies whose policy is to

1. Basic Research and National Goals. A Report to the Committee on Science and Astronautics U. S. House of Representatives by the National Academy of Sciences. March 1965, p. 140.

restrict this research to the parent company. Legislation to force them to do Research and Development in Canada would be invidious. We believe, therefore, that a compensating proportion of the total Research and Development expenditure in Canada should be devoted to that undertaken in the Universities. Hence, the percentage of the total Research and Development budget that is allotted to the Universities should be higher than the equivalent allotment in the United States.

We also find that most of the support for research in at least the smaller universities is now being provided through the education budgets of the Provinces. This support is in the form of salaries of staff, provision of research space, and so on. We believe that it should be the National Science Policy, not only to take on this support directly, but also to increase it substantially.

Conclusion

It is difficult to ascertain exactly the amount of support that should be given to any individual university, but we propose that the following become the National Science Policy:

- (a) to make, with due regard to the social implications, a substantial annual basic grant for research to each University,
- (b) to provide substantial additional funds through a

national granting agency, such as NRC, for such special projects as Centers of Excellence, Interuniversity Projects, Outstanding Scientists, Large Installations, and the like.

We trust that the above suggestions will be of some use to the Committee in its deliberations, and, if adopted, of some help in increasing the scientific output of Canada as well as improving the economic balance between various sections.

Respectfully submitted,

Dr. J. J. MacDonald
Dean of Science

Dr. E. M. Clarke
Head, Physics Department

APPENDIX 62

A Brief
to the
Senate Special Committee on Science Policy
by
Memorial University of Newfoundland

Submission to the Special Committee on Science Policy
of the Senate of Canada

1. Following the request of the Honourable Maurice Lamontagne, in a letter dated December 20th, 1968, officers of the University have given consideration to the broad purposes, policies and mechanisms which ought to be sought and established through the Federal Government's support of university research in Canada. This University welcomes the opportunity to present its views on these important matters.

I. Goals for the Federal Government
in the Support of Research

2. We set out below in summary form the broad picture of the goals which we consider the Federal Government should have before it in the support of research.
3. Up to the present time, Canada's remarkable economic and technological developments have been based in large part on research and development activities in other countries.

In an address to the Conference on Education and the Development of Human Resources in 1966, Dr. John Deutsch

remarked: "In the past, Canada has depended almost wholly on other countries for its technology and know-how. The (Economic) Council has emphasized that the attainment of our goals now calls for a much larger Canadian effort in research and in the use of the latest available techniques."

This is not to decry in any way the unique and outstanding contributions of Canadian scientists, engineers and scholars in a number of fields. Indeed, by their rarity, these highlights stand out all the more brightly. Nor is it to decry the effects of the Federal Government's quadrupling its support for research in Canadian universities since 1960. But we think that the time has now come for Canada to match its economic and technical achievement with a research infra-structure which will enable it to advance still further. Such an advance will not only provide the basis for the further exploitation of the vast natural resources of Canada, and thus continue the upward movement in Canadian living standards, but will also establish Canada in a position of world leadership in certain spheres of research and enable us to repay to the rest of the world the intellectual debt which we have incurred through our dependence on the research of others.

4. Such a research infra-structure must be based partly on

government research institutions, partly on industrial and commercial enterprise, and partly on the universities. In all three places, success should breed further success, not only by holding our own scientists, engineers and scholars, but by attracting talent from elsewhere. The biggest single magnet for the outstanding research worker and scholar is not money, but the presence of other outstanding workers.

In the case of the universities, success has another benefit. It conditions all the youthful potential talent of Canada during the crucial years to a research-orientated way of life. In the long run, our supply of scientists, engineers and scholars for all types of institutional activity, is dependent upon the milieu in which they reach maturity. Unless, therefore, we have in our universities powerful and outstanding schools of research, there cannot be an adequate scientific basis for the totality of our national effort and achievement.

5. It follows that Federal support for research in universities is an essential condition for national development. Indeed, taking a long view, it may well be that the speed and extent of our national development may be directly proportional to the amount of national investment in university research.

6. This is subject to certain vital qualifications. It is possible and indeed easy, to waste money on research of dubious quality. This is why those responsible for overall research grant-giving policy have in the past tended to cultivate and nurture areas of excellence. Such a policy is sound. But there is a second qualification. It is equally easy to play safe and neglect potential, simply because this potential may not be realized. Here, it is our view that Canada has been far less successful. If potential is to be successfully exploited, it must be sought out and fostered.
7. A third qualification is this. Research effort must be developed within a long-term strategic plan. Examples can be found within any university and throughout Canada where the desire to "keep up with the Jones" has led to reduplication of facilities, with consequent underutilization of available facilities and the spreading too thin of that most precious commodity, skilled technical manpower. Any policy of fostering excellence is bound to lead to some duplication, and this is no bad thing. But multiplication, for example, of accelerators and high-powered computers, simply because the University next door has them, is a costly and wasteful folly.

It follows that co-operation between universities in making

use of costly facilities is essential. In achieving this co-operation, Federal grant-giving agencies have a vital role to play. They can force would-be expensive prima-donnas to orchestrate their efforts.

8. Canada, by its geography, presents a special challenge to those responsible for planning the totality of our national research effort. As in the U.S.A., and the U.S.S.R., Canada offers an opportunity for planning research within the diversities presented by a country which is virtually a continent. Climatically and mineralogically, she resembles the U.S.S.R. and complements the U.S.A. Canada can be, if it so wishes, the mirror in the non-communist world of the research effort of the U.S.S.R. In the U.S.S.R., research is planned, perhaps indeed overplanned, to meet human need. Given the base-line from which operations started, the U.S.S.R.'s achievement has been spectacular. We start from a far higher base-line. Our achievements can, if we set our sights high enough, be even more spectacular.
9. It may be argued that our relatively small population sets a limit to what we can do. Of course, it does set a limit, but in research, small nations can do great things. Scotland has been the nursery of both medicine and engineering. Sweden and Switzerland have made for

themselves unique positions in the advancement of mankind. Up to now, the people of Canada have displayed their genius largely in subduing the vast territory in which they have found themselves. They have done this so well that they can now, with profit to themselves and the world, devote an increasing measure of their effort to seeing long-term answers to the problems which are posed by their unique geography.

10. Canada is singularly fortunate in that its geographical diversity is matched by a large measure of political and cultural decentralization. In consequence, within each province, there has grown up at least one outstanding university. Each such university strives to have, and indeed ought to have, its own place in the totality of the world of science and learning and scholarship. Insofar as this has been achieved, it is largely the result of Federal fostering of areas of excellence. But each is also a potential centre of regional research. Each, unless it aims to be no more than a liberal arts college, should exploit to the full the unique opportunities which are presented by its own special environment. To some extent, this has been done. But it is in the exploitation of uniqueness that we feel that achievement so far has been inadequate. It follows that it is here that a planned Federal grant allocation policy can reap its richest rewards.

11. If research is itself the infra-structure of economic and social development, research today is impossible without an infra-structure of its own. It needs costly and extensive buildings which must be furnished, lit and warmed. It needs secretaries. It needs library facilities. It needs highly-skilled technicians and laboratory assistants. It needs services and equipment. It may need animals and animal houses. It may need field workers, for social survey work or for geological or geographical surveys. Often it involves travel. Sometimes it needs boat time or plane time. Without this infra-structure, the individual, no matter how skilled, cannot function. If exploitation of potential is to be achieved, a way must be found of providing this research infra-structure.
12. By and large, provincial governments have been concerned to see to it that their universities have been capable of providing education for the young people of their provinces up to first-degree level. By and large, this has been or is being done. But at graduate level, and it is here that research begins, physical provision has been more meagre. And for the main infra-structure for research itself, it has been more meagre still. Yet it is only when graduate training starts that the real research potential of a community starts to be released. It follows that support for graduate training and the physical and staff infra-structure for graduate training is no less important than the infra-structure for research itself.

13. Provincial effort must largely be a function of provincial wealth. A wise province, despite its poverty, may invest more than pro rata of its gross provincial product, in its university or universities, realizing that its long-term prosperity is dependent on the skill of its human resources. But, with the greater claims on its financial resources which its inherent poverty imposes, there is a limit to what a relatively poor province can be expected to set aside for higher education. So a vicious circle arises. The infra-structure needed for research is lacking. So research itself cannot develop as it should. So the research infra-structure for economic and social development is denied precisely to those places where it is most needed. Unless the vicious circle is broken by the deliberate and purposeful creation of the infra-structure need for research in the universities of the under-developed areas of Canada, their immense potential cannot be released. We shall have a Canada largely parasitic on a few great metropolitan centres, with a vast hinterland of neglect and welfare and wasted opportunity. Of nowhere is this more true than Newfoundland.
14. Two further points must be made to support the contention that Canadian research must in part be diffused over the whole of the nation. First, it is our belief that the people at the periphery are no less intelligent and resourceful than their counterparts at the centre. They

are rugged, independent-minded and resourceful. They can, if the opportunities are available, make a major contribution to Canada's research future. Strangely enough, they like their environment. They believe their way of life is a good one. And most of them are reluctant to leave it. We would be prepared to argue that they are right. By bringing research opportunities to them, not only will they be able to enrich their Provinces, but they will enrich the nation as a whole, and perhaps the world.

15. The second point is this. Life in great cities is by no means Utopia. To commute long distances to work and to be barred from the countryside by miles of suburban development, are heavy prices to pay for amenities of great city life. We believe that the balance is now delicately poised. We are finding it far easier than we expected to recruit to Newfoundland top-flight medical scientists for our Medical School, in part because they are tired of great-city life. Our conception of the future of Canada is a happy and thriving but purposefully limited core, and a no less happy and thriving but purposefully developed periphery. In the achievement of both objectives, we believe that the flow of Federal funds for research will play not merely a large but an essential part.

16. In the above remarks, we have used the term "research" to cover research in both the physical and social sciences. We are particularly conscious of the need for and value of social science in the underdeveloped community of Newfoundland, the more so because, at Memorial University, research and scholarship in the humanities and social sciences have been developing apace. Newfoundlanders have literary and political traditions which have made substantial contributions far beyond the boundaries of the Province. Now, within the framework of modern scholarship and rigorous scientific method, they are already showing that they can match the rest of Canada in developing these traditions.

We therefore warmly support the remarks of the late Prime Minister, Mr. Lester Pearson, to the inaugural meeting of the Science Council of Canada, when he said:

"I hope also that in your studies you will explore the boundaries of science to ensure that no promising area is overlooked. There is, I believe, a very real danger that, in our complex society, important borderline areas between different scientific disciplines and between science and the humanities, may be left unoccupied - either from lack of interest or, more often, from lack of financial or institutional support. I feel very keenly that the study of science's relationship to society should by no means be the sole province of philosophers and political scientists.

"So I urge you to join with the humanists and others who approach knowledge from a different direction, to ensure together that adequate bridges are established between our pure and applied natural sciences and our social sciences and humanities. For wisdom, surely, must be the composite of all knowledge and all experience."

We would urge the Committee to support Mr. Jean Boucher's recent appeal for greater federal aid on behalf of the Canada Council's research related activities in the humanities and the social sciences.

17. We have also used the term "research" to cover both pure and applied research. Again, we quote Mr. Lester Pearson:

"To this end, we want to know that the very best available scientific knowledge and resources are being brought to bear on problems - new and challenging problems - such as water resources and water pollution; transportation; urban planning and development; automation and employment; public health; poverty in all its guises and ramifications.....
.....I hope that you will consider whether we are using the best available knowledge from science and scientific research in dealing with such problems."

In Newfoundland, we are familiar with all these problems. We are familiar with poverty and the diseases arising from poverty. We are starting to provide biological base-lines for unpolluted water. We are in a special position to explore the science of the oceans, and its development, both as a source of power and as a source of food. We are ripe for urban planning to prevent suburban sprawl. Even automation in our paper-mills is presenting its problems. Yet, in each of these spheres, by solving our own problems by applied research, we can add to the totality of human knowledge in the pure research field.

We recognize the critical importance of some research results which have no practical aim; and we agree with

Mr. Pearson in his assertion that, "in the national interest.....we must continue to support generously those rare intellects capable of unusual discoveries when they are given free rein and adequate resources." We know that Canada has a distinguished record in basic research and that our standing in this area should be maintained. The plea here is rather for a balance in objectives: ".....we would be as wrong to concentrate entirely on this vitally important outer edge - forgetting to put to use the vast body of knowledge that already exists - as we would be to concentrate solely on using what we know, ignoring the challenge to push the edge to new and unknown horizons." Moreover, out of applied research often comes basic knowledge, just as from pure research, applied results of the greatest value may appear quite unexpectedly.

18. Any realistic examination of the Federal Government's support programme for university research must take into account the facts of Canadian political life. Clearly, the Committee has to face the practical limitations of a Federal political structure. But there are, as Mr. Pearson has stated, "bound to be differences of view in a federation as to precisely where the respective areas of jurisdiction begin and end." Despite the many interjurisdictional problems, we know that in real terms education, training

and research tend, in Canadian circumstances, to be mutually reinforcing. Although "education" is assigned by the constitution to the provinces, it nevertheless is true that the Federal Government has a clear responsibility ".....to devise and apply national policies and measures that are necessary to ensure that the economy of Canada will continue to expand and will become increasingly productive, in order that there may be full employment and an increasing level of prosperity for all our citizens."

Acceptance by the Federal authorities of responsibility in this latter respect justifies the expanded Federal unconditional support for post-secondary education, which was announced at the Federal-Provincial Conference on October 23rd, 1966. At the same time, it would appear only fair to both the Federal Government and the Canadian taxpayer, that the amount of the contributions which the Federal Government is making to post-secondary education in the Provinces should be clearly and continuously enunciated, if only to ensure that intent is fully realized.

At the same Conference, and for the same reason, Mr. Pearson rejected the contention that provincial jurisdiction in "education" excluded Federal activity in fields such as cultural affairs, manpower training, adult education, and

research. As regards the latter area, we cite his words:

"Nor does the Federal Government agree that it is precluded from concerning itself with research by reason of the provincial responsibility for "education", or alternatively that it must limit its support according to subject matter in relation to areas of Federal and provincial jurisdiction. In our view, research, as the means by which we expand the frontier of knowledge, is today one of the most important factors in the economic and social growth of any modern political society. The restriction of Federal aid to research to subject matters that are within Federal legislative jurisdiction would frustrate the purposes of the scientific spirit.

"If this country is to have an active and vigorous research programme which will redound to the advantage of all its citizens and add effectively to our fund of knowledge, governments at any level must feel free to sponsor and support research of any kind without being limited by conceivable legal classifications of its results or its end uses. Failure by the Federal Government to play its full share in such a national task could only mean that Canada's ability to take part in the undertakings of today which are shaping the world of tomorrow would be seriously impaired." (Statement by Mr. Pearson for the Federal Provincial Meeting, October 24, 1966, pp 26-27).

19. In the same statement, Mr. Pearson asserted that Federal expenditure programmes on behalf of scholarships or bursaries "to assist people either in carrying out research or in acquiring post-graduate knowledge in the fields of the arts, the sciences, or in the pursuit of certain specialized subjects.....or merely through attendance as students at an institution of higher learning were in no way contrary to the spirit, let alone to the law, of our constitution.....nor.....necessarily any threat to provincial policies with regard to education."

He went on to say that - "We hope to continue (these programmes) in co-operation with the provinces. Such payments to individuals for their personal advancement and improvement are, in our view, a part of the equalization of opportunity that is so central a feature of the Federal purpose." (Our italics, Ibid, pp 27-27).

20. It is clear that equalization policy now rightly influences the Federal approach to post-secondary education, manpower development and research support in universities, as it has shaped its general fiscal relations with provincial governments to an increasing degree during the postwar period.

In spite of the many difficulties of obtaining agreement on a definition of "equalization" in the university research sector, we strongly urge the Committee to bear in mind the explicit Federal objective of ensuring "equal access to education and equal personal opportunity for all our citizens". (Ibid., p.28).

Indeed, Mr. Pearson's reiteration of the equalization principle in his concluding remarks at the Conference leaves no doubt concerning its central position among competing goals: "While there can be differences of definition and of judgment as to the extent to which there is inequality, it must be clear beyond doubt that, so far as the Federal

Government is concerned, its objective is to see that not only is equality real within this country, but the sense of its reality is brought home with conviction and confidence to all our citizens everywhere". (ibid.)

II. The Universities' Objectives in Conducting Research

21. Being the sole institution of higher learning in Canada's poorest province, and having to deal with the practical problems arising from geographic isolation, we are particularly sensitive to the reinforcing interactions among higher education, training and research. The lack of a proper research atmosphere and facilities denies those persons whom the university needs, indeed those it must have, the opportunity to carry forward their studies. This condition lowers staff morale, increases the turnover rate of key research-oriented professors, reduces the quality of higher education generally, and prevents the development of many intrinsically viable research undertakings in the provincial setting which would contribute effectively to national scholarship.

Further, the inadequacy of research infra-structure seriously hampers the work of the university in regard to the provision of contract research in the public interest and in assuring adequate training to meet community needs for skilled manpower.

We agree with the view of Dr. John Deutsch concerning the relationship between education, training and research and the long-term performance of the provincial economy.

"There are also significant differences in the average educational attainments among the main regions within our own country. The (Economic) Council has noted that generally the areas where average educational attainments are lowest are also the ones which have the lowest average incomes. There are wide disparities in the resources which each region is able to spend on developing its educational programmes. Obviously, it will take more than just better education to reduce the longstanding and substantial income differences among our regions, but the gaps in education and skill are clearly one of the most serious discrepancies which must be overcome if our efforts to achieve a better balance of opportunities are to be successful."
(Address to the Conference on Education and the Development of Human Resources. Montreal, September 8, 1966, p. 7.)

We recognize the valuable equalization effect of current general federal fiscal, post-secondary education, manpower training and other specific programmes. Indeed, the present development of Memorial University would not have been possible without some of these measures. We consider the research function to be so critical, however, that further measures of equalization should be embodied in this particular area of federal policy.

22. To this end, we recommend that the Committee consider the development of a supplementary national university research support programme, which would help to diminish locational disadvantage and to provide a stimulus for greater regional balance and specialization in research activity. In devising such a policy there should be recognition of differing levels of need, responsibility, and capacity among universities in the various provinces.

In our view, a more considered approach to university research planning in Canada, together with a properly controlled federal supplementary policy of expanded research development grants, would materially contribute to the achieving of desired ends. In making this recommendation we do not wish to imply that the aim of federal policy should be to equalize research support funds among Canadian universities in accordance with some crude formula. Neither do we believe that such policy should place primary responsibility for the development of university research objectives and programmes in the hands of a federal research agency. But, inevitably, as we have indicated above, local autonomy must be related to a broad national strategy.

III. Allocation of Funds in
Support of Research

23. Broadly speaking, the allocation of federal funds in support of university research ought to be controlled by an integrated research policy that serves in an appropriate manner the basic objectives outlined in Section I above. Beyond this general directive, it is possible to develop criteria of need based upon such factors as:

- (1) total number of individual grants and project applications in the several research areas;
- (2) the number of graduate students being trained at various levels in the areas;
- (3) estimated total cost per research worker in the areas; research productivity; and regional-provincial supplementary development needs.

24. It is our opinion that entirely new institutions and new mechanisms for determining and reviewing allocations will be needed in future. We do not, however, recommend that a single omnibus federal research support agency be established.

We believe that the goal of integration can be adequately served through alternative methods of co-ordination and liaison as between the Canada Council and the N.R.C. (or its successor).

In the area of the social sciences, we recommend that some single agency be charged with the responsibility of providing

"clearing-house" functions among university research institutes and personnel, and the many federal agencies active in sponsoring or requiring this type of research.

25. The problem is not purely a mechanical one. We have to evolve, indeed we may already possess in certain areas, a mechanism for the distribution of funds which can operate at optimum real efficiency. Pseudo-efficiency in allocational policies may look good but will not be in the best interests of either the nation or the provinces. We must be concerned that policies are so devised that they reduce rather than accentuate the gross disparities that now exist between one part of Canada and another, between different areas of academic activity, and between disciplines within those areas. Such policies must recognize the essential nature of research in the process of developing higher education and the consequent necessity for each province to sustain at least one major centre of research activity. They must recognize that certain kinds of research are best done in situ; and that research per se, in whatever academic discipline and whether linked directly to economic goals or not, is a legitimate activity of scholars and one worthy of support.

26. In part, what we propose can be achieved by providing larger sums of money to the Canada Council, and to departments and agencies of the Federal Government who rely upon the universities for research in the social sciences. Such allocations would allow scholars in the humanities and social sciences with legitimate research projects to apply

for grants in aid in the same way as scientists now apply to the National Research Council, and with like chance of their applications being approved.

It is of vital importance that major development grants should be made available in the humanities and social sciences, as they already are in other areas. The importance of such grants may perhaps be illustrated by reference to an area of great potential, which is decidedly underdeveloped in Canada and is also extremely costly. We refer to the institutions necessary to sustain effective behavioural research by academicians.

27. In arguing that the allocation of research funds should take into account the necessity to support individual scholars and the necessity to think, to some extent, in regional or provincial terms, we are not arguing that any attempt should be made to create an important research centre at every university in Canada. Nor do we argue that Federal funds should be distributed across the nation by means of any gross formula that would attempt to make unequals equal.

Certainly, success must be supported and centres with developed facilities for effective research must not fail to receive support so that funds may be diverted to undeveloped and, for this reason, risky enterprises. But neither must we, as we so frequently now do, adhere rigidly to the biblical injunction that "to him who hath much, much shall be given". For such a policy will not only retard

developments in areas where they ought to be taking place, but will be self-perpetuating.

28. Nevertheless, we feel that there is a very strong case for the creation of a supplementary national university research support programme as suggested in paragraph 22 above. Such a programme could play an essential role, particularly in the development of regional research facilities and in the encouragement and support of research which, because of environmental considerations, should be developed at specific universities.

As examples of the first, we suggest the establishment of regional bibliographical centres and regional data banks serving a number of universities and other research centres through sophisticated electronic and inter-library loan services. This would appear to us to be a matter of top priority since the development of an adequate research library is beyond the financial grasp of most universities and, in any case, the large scale duplication of major facilities would appear unnecessarily extravagant.

With reference to the second sort of development suggested above, we believe that developments of regional or local interest should be encouraged by providing help to establish at specific universities institutes whose research activities would be of importance to provincial development. Four specific examples may be cited:

- (i) The creation of an institute, suggested by the construction of a large phosphorous plant at Long Harbour, Newfoundland, devoted initially to research in phosphorous and silicon chemistry. This might well help to stimulate the growth of secondary phosphorous-using industry in the region. In time, there might develop a centre for extensive studies in the chemistry of numerous non-metallic elements, for example, nitrogen and arsenic.
- (ii) The vast power resources of the Province of Newfoundland suggest the possibility of establishing an isotope separation unit, with the concomitant commercial development, on the lines of the Israeli programme. The involvement here would be with heavy water, 18O , 17O and other isotopically enriched materials.
- (iii) The geographical location of Newfoundland in relation to important fishing grounds in the North Atlantic and existing Marine Sciences Research Laboratory suggest the development of a regional institute of cold-water marine biology.
- (iv) Ocean orientated research should cover much more than marine biology. Marine aspects of civil engineering provide an outstanding example, as also does marine geology and under-water research techniques. Here research activities can be expected to stimulate future industrial development.

These four examples will suffice to illustrate the point we wish to make. We could add research in natural resource chemistry, in trace element metabolism and in medical genetic abnormalities, in all three of which fields Newfoundland offers special opportunities.

29. In considering the establishment of a supplementary national university research support programme, as outlined above, we must bear in mind that not all Provinces are so fortunate as Newfoundland in having only a single university. For this reason those who plan such a programme must be very careful

not to interfere with Provincial attempts to rationalize their own research support operations. Rather, there must be full co-operation so that the one programme supports and complements the other.

30. In a general manner, we have referred above (Paragraph 24) to the need for new institutions and mechanisms for determining and reviewing federal allocations in support of university research. In the development of a supplementary programme aimed at increasing regional equality, we recommend that all universities be encouraged to supply a five-year projection of their research activities indicating areas of specialization, budgetary requirements, and the degree of university support for staff, library resources and technical services.

Allocations to be approved under this heading should be made only after an appraisal by a visiting committee. Development grants should be awarded for a five-year period, and research projects undertaken in this area should be subject to stringent appraisal by a review committee.

31. There still remains the question of what level of financial support the individual scholar and the individual institution can expect to receive directly or indirectly from the Federal Government. We believe that a system of grants in aid is most equitable to all concerned; for it provides not only for the careful screening of individual researchers and their projects but also places an appropriate part of the

responsibility for supporting research upon the universities and the Provincial Government.

32. This leads us back once more to consideration of the indirect costs of research and how they should be met. It is clearly a matter of logic that the Federal Government's assumption of responsibility for the support of research carries with it the responsibility for support of the indirect costs. In this matter we agree with the recommendation contained in the Bladen Report - "That all Federal Government research grants to universities.....should carry with them a 30 per cent supplement as an unconditional grant to the university."

Furthermore, we propose acceptance of a modified version of another recommendation of the same report, viz. that a general sustaining grant for research be paid annually to universities in receipt of Federal research funds equal to 10 per cent of the aggregate salaries of all members of the academic staff who receive Federal grants in aid of research.

33. In view of the pressing need for well trained university staff and research personnel, the Federal Government should continue to share in the cost of training. The Canada Council pre-doctoral programme should be expanded. In addition, the Council should consider making allocations in the humanities and social sciences comparable to N.R.C. operating grants which provide some indirect support for Master's candidates who are engaged in research activity.

The Council, in our view, should not return to its original policy of awarding M.A. fellowships directly.

34. The kinds of grants required are suggested in the various paragraphs above. More and in some cases larger grants are needed. In the humanities and social sciences there should be a greater number of post-doctoral awards and improved methods ought to be found which would enable scholars to meet a portion of travel costs associated with legitimate projects. In the sciences there is need for an intermediate-sized N.R.C. Negotiated Development Grant having less of a "do-or-die" commitment attached to the award, and being of a value of up to \$100,000. In general we accept the principle that N.R.C. grants should be made to individual staff members; but greater efficiency in the deployment of scarce university resources would result if a larger portion of the available support could be made available in the form of a general grant to the University.
35. In the matter of contract research it is our firm belief that the contractor should pay the entire cost, including indirect costs. The danger that exists in this respect is that university staff members in an attempt to keep estimates to a minimum in order to receive contract awards will place an unrealistic value upon the cost of research in general, but in particular upon the indirect costs. For this reason, a standard formula might be evolved for determining overhead

as a set percentage of direct costs.

IV. Liaison

36. A great measure of liaison in research planning and policy formulation was suggested earlier. In accordance with the principle of integration, new linkages should be created as between federal and provincial governments, between the Canada Council and the N.R.C., and between universities, government departments and government research institutions. The principle of utilization would be served if arrangements could be made which would promote exchange fellowships and research associateships among universities and government institutions. Finally, there is a clear need for a more comprehensive and more integrated reporting of research undertakings sponsored or supported by government agencies in the social sciences. The Index of Federal Grants in Support of Extramural Research in the Social and Behavioural Sciences represents a first step in the right direction, but a more general information service on current research undertakings is required.

V. Review Procedures

37. We have already referred in paragraph 30 above to review procedures. In addition we recommend that visiting committees appointed by the National Research Council, the Canada Council, and such other agencies of a like nature as may be created, be sent from time to time to review research activities being conducted in universities receiving Federal research support. We recommend a continuation of the present procedures for assessing the merits of applications for negotiated development grants. Moreover, we fully realize the possible impermanence of any structure which may now be established. Within a decade at most, the need for another review will probably arise.

APPENDIX 63

A BRIEF SUBMITTED TO
THE SPECIAL COMMITTEE ON SCIENCE POLICY
OF THE SENATE OF CANADA

BY

SCIENCE FACULTY
SAINT MARY'S UNIVERSITY
HALIFAX, NOVA SCOTIA

Dr. W. A. Bridgeo, Dean of Science
Rev. M. W. Burke-Gaffney, S. J., Professor Emeritus,
Astronomy
Dr. G. Gordon, Chairman, Psychology Department
Dr. M. Wiles, Chairman, Biology Department

MARCH, 1969

SCIENCE POLICY OF THE FEDERAL GOVERNMENT

This submission is directed at Sections (c) and (d) of the Terms of Reference for the Special Committee on Science Policy of the Senate of Canada.

- (c) federal assistance to research and development activities carried out by individuals, universities, industry, and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient policy for Canada.

The viewpoint is that of an undergraduate science faculty (honors level)--and a university dedicated to developing the relevance of science to humanities and vice versa. In order to perform our role well or to get meaningful results it is necessary that both our science program and humanities program be of highest quality. It is with an eye to maintaining this quality and graduating a student with a keener consciousness of values in science and relevance of scientific effort to man's development, that the following comments are made.

Federal Assistance to Research and Development Activities

The authors of this brief are aware of the role which the Federal Government has played in supporting research at universities. That role was played mainly through the offices of the National Research Council ¹(of 47.9 million dollars expended by the Federal Government on all aspects of University Science in

1967-68, 45.3 million dollars or 94.6% was provided by the National Research Council). We concur that the Federal Government should play this role and indeed this represents the biggest source of funds for university research in science for all universities in Canada. The development of new knowledge is very expensive and regardless of where it is developed, it is made known to the country as a whole and beyond for application by whoever needs it. This type of effort is thus national in scope and should be supported by the national government at which level efficient allocation of funds can be made so as to prevent duplication of effort on major sized programs.

The existing program does not do enough for science teaching at the undergraduate level. For example, of the 45.3 million dollars the National Research Council allocated to University Science in 1967-68, only 1.4 million dollars (3%) was assigned for general scientific activities; the great majority of funds was assigned to professors' research and travel, computers for staff members, post-doctoral fellowships and graduate awards. Obviously then, at the present time, undergraduate science departments can only receive direct Federal help through individual staff research activities, for there will be no graduate awards made and virtually no post-doctoral awards. In addition, the Negotiated Development Grants are awarded to those institutions which are already carrying out meritorious research projects through the agency of research groups, providing that the groups are making significant advances in their fields. This policy of course favours big universities and particularly those in the richer provinces, or those with large endowments.

These grants are of little help to smaller institutions that might justifiably wish to launch a co-ordinated scientific research project involving several researchers.

The one National Research Council policy which is helpful to the smaller university in the initial stages of developing its research program is the Supplementary Grant to the President of the university, amounting to a maximum of \$25,000 per year for three years. It is felt that the amount is small in relation to the set up costs involved in establishing research, and when it has to be distributed over the whole university science program. When one considers the overhead charges, technician help, the equipment and supplies purchases, this amount would probably permit work equivalent to one scientist conducting research for one year. We suggest that to have a more meaningful and interesting research effort (integrated with undergraduate education) even in a small university, several professors (3 - 6) from one department or a similar sized interdisciplinary group from two or more departments should be involved. The research can be scientifically challenging from the points of view of pure and applied science. At the same time it can be relevant to social and human needs. Such activity on the part of a faculty interested in teaching students and demonstrating to students the application of science to real problems, together with discussions on the sociological implications and human values involved, should play a valuable role in undergraduate education of tomorrow's citizens.

In order to bring this about, good professors must be given the opportunity and facilities to do research. Assuming the university

and the provincial government supply the necessary serviced space it is still necessary to find financial support for operational costs including the salary of full time technicians. The latter is necessary because the teaching activity is of such importance and is so time consuming at the undergraduate level. Only if the professor has another pair of skilled hands working on his ideas while he teaches can meaningful research be done in a reasonable time. The provision of full time technician help should also be considered as provision of jobs for skilled people in a given area, who in addition, will teach by example because of their close association with the undergraduate students.

The following resolutions, numbers 24 and 26 were passed by the 1967 Annual Meeting of the Association of Universities and Colleges of Canada:

"24. RESEARCH SUPPORT FOR SMALL UNIVERSITIES

That the AUCC encourage support for research in small universities, sufficient to provide on a continuing basis assistants and technical services necessary for efficient research.

26. FULL SUPPORTING COSTS OF RESEARCH

That the AUCC urge agencies which provide research funds to universities to include in their grants the full supporting costs of the research." ²

It is suggested that:

- 1) A new National Science Policy include the support of university programs designed to develop the wise use of science--an investment in such science education should be regarded as an investment in the future of the country which will have a very good rate of return. Dr. Peter Muirhead, ³Acting Deputy Commissioner of Education, Washington, D. C., reported that Federal Government financial assistance to G.I.'s for their higher education has been returned to the Federal Treasury many times over by virtue

of the increased taxes paid by those educated.

- 2) The above Association of Universities and Colleges of Canada's Resolutions, 24 and 26, be implemented by Federal Government Granting Agencies.

We note with approval the decision of the National Research Council's Associate Committee on Experimental Psychology to modify its attitude towards Experimental Social Psychology. We assume that this is the implication of the omission in the Committee's Procedure for Grants in Aid of Research, (Revised 1968) of the phrase, "However, social psychologists are requested to submit their applications to the Canada Council," which appeared in the earlier Procedures. In 1966 according to the Privy Council Science Secretariat Special Study, "Psychology in Canada,"⁴ the Canada Council gave just seven grants to a total value of \$58,169 to psychologists compared with 105 grants totalling \$590,052, given by the National Research Council.

We recommend that the Associate Committee extend its support to a broader range of psychological research both basic and applied. The reason for this is that we do not know, at this stage in the development of the subject, what will or what will not prove to be the productive research areas of the future. Granting policies favoring over-specialization of research may lead to a stunting of the growth of other, potentially valuable, areas. This is a plea for balance.

Discussion on Some Broad Principles for a National Science Policy

The encouragement of industrial research in Canada is a difficult task because of the "subsidiary company" or "branch plant"

situation that many of our leading industries find themselves in. Incentive schemes of the Federal Government have not appeared to make a significant change in the growth of industrial research in the country and certainly not in the Atlantic Provinces, when only two companies have participated in the National Research Council's Industrial Research Assistance Program which is the most attractive because of the minimum amount of red tape involved.

It does not seem logical to hope that the vast majority of existing companies will do innovative research for sound reasons:

- 1) they can buy research results cheaper;
- 2) they do not have a background in research--such firms are wise enough to know that if a company does not know how to do research it is very risky and as in most activities one pays for the experience of finding out (this statement is a conviction after fifteen years experience with many industries, individuals, and organizations interested in "using" the results of science and technology);
- 3) tax incentives are not sufficient.

In constructing a National Science Policy which will encourage existing industry to do more research, the Federal Government will have to be selective and offer extensive support to those industries which have the most ability and interest. People and their skills are what count. They must be identified, surveyed, and supported. At this stage in our development a formalistic approach is very apt to be unproductive.

A National Science Policy should attempt to minimize the loss of effective research and development personnel. There is a large loss of competent research and development personnel each time a major project is scrapped such as the AVRO Arrow. The ING could be

another example. We are not questioning those specific decisions, simply pointing out that it is our opinion that the people who do research are the most important ingredient and one must work hard for years to assemble a team of people who are "effective"--not all researchers are effective. It is a serious loss if in one fell swoop their jobs are removed and they leave the country to find appropriate employment elsewhere. There is a common attitude among people in positions of power that they can hire and fire research staff when it suits them and still expect fast results when required--not realizing that the more closely a project approaches pure research the less subject it is to scheduling and planning.

The fact that administrators of science in this country today are scientists is logical, for by and large, they are the only people in the country who understand what science is all about. This situation will become less true as more and more people in other walks of life make it their business to encourage communication with scientists and to learn about science, why it is done, how it is done and who does it. It will be a mistake to let the pendulum swing all the way from government of science by scientists, as is the case in Canada now, to government of science by people or representatives of people who understand very little of what science is. To permit this is like squandering our national resources for the sake of a formalism and we hope and trust it will not happen. It is the opinion of the authors of this brief that serious and able scientists and administrators of science have been aware for the past four or five years at least, of the need to communicate with the general public and to see that the results of science are used

in a constructive way. The T.V. program, "The Nature of Things," is evidence of this. The many programs on space science are more evidence. The move has started, it is only necessary to speed up the process.

If the country needs scientifically and technically trained people to provide the innovation to man a more sophisticated industry, to compete in world markets and keep the economy in a strong position relative to other countries, then:

- (1) it must lead in certain areas of industrial activity, the sale of certain natural resources is a traditional activity in which Canada leads
- (2) in addition some way must be found to research, develop and commercialize Canadian ideas and human energies
- (3) research in universities which is part of the higher educational process must be more relevant to life in Canada--not entirely but significantly so
- (4) employers must be ready to give those who attain higher education opportunities to work and apply their knowledge and skills.

Furthermore, if the existing industrial empire cannot absorb the educated people of our country, then a new type of industrial activity should be encouraged to develop. Universities might be considered as employers of the skills they produce. Research and development companies could be encouraged to grow around university structures effecting economies of operation by using university facilities, developing research results obtained in the university and sharing profits from commercialization with the university. The spin off from joint activity of this kind could be real cooperation between government, industry and university sectors of the national research effort. Approximately twenty years of such a program could

produce a type of industry in Canada which would be research based. It has been predicted that 50% of the GNP in the United States in the year 2000 will come from the "knowledge industry"³ (the dissemination and application of knowledge).

From the point of view of regional development in Canada, it has been noted that Prime Minister Trudeau hopes to bring prosperity to the Atlantic Region through the creation of a quality environment. It is suggested that a major part of the research on environmental problems affecting this area be done by scientists, engineers, economists, etc. from the area at one or more centers of excellence. Perhaps there should be one center to focus on the marine environment and one focusing on the environment associated with our land areas. Governments, universities and industries should be associated in this research and development. It is very opportune that the Prime Minister should take the stand that he has taken for it is well known that the best way to control pollution is not to allow it to start. The environment in the Atlantic Region is relatively clean now. What pollution does exist can be cleaned up. A science policy for this region will encourage programs designed to clean up existing pollution as well as programs designed to determine the capacity of our environment on a micro scale (a bay, a stream, an area of soil, the air currents over a specific area) to absorb pollutants so as not to exceed permissible and desirable standards.

Over and above the specific example of environmental research the economic growth of the country has regional aspects. It is suggested that a National Science Policy take this into consideration. Education and science form the foundation of economic

growth for the remainder of this century. In so far as our economic growth has a regional pattern, education and science policy should be considered in part on a regional basis.

Recommendations

It is recommended that:

- (1) The National Research Council be the major granting agency for federal financial assistance to university research but that selection committees be broadened to include humanists, economists, and industrialists and that the worth of a program be recognized as well as the ability of the researchers.
- (2) A National Science Policy stressing the use of science should include assistance to undergraduate science teaching--the education of science graduates with an orientation on the values in science and its use will make better and more productive citizens in our technological society.
- (3) The resolutions, 24 and 26, passed at the 1967 Annual Meeting of the Association of Universities and Colleges of Canada be implemented.

"24. RESEARCH SUPPORT FOR SMALL UNIVERSITIES

That the AUCC encourage support for research in small universities, sufficient to provide on a continuing basis assistants and technical services necessary for efficient research.

26. FULL SUPPORTING COSTS OF RESEARCH

That the AUCC urge agencies which provide research funds to universities to include in their grants the full supporting costs of the research."²

- (4) A new National Science Policy encourage the growth of the "knowledge industry" including research and development companies.
- (5) A greater effort be made to encourage research and development in regions where the level of economic activity is below the national standard as a means of encouraging economic growth through mission oriented research and development.

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APPENDIX 64

A Brief

to the

Senate Committee on Science Policy

by

Dalhousie University

INTRODUCTION

In order to develop Canadian scientific effort so that it may have impact, becoming more productive and less wasteful, it is necessary that a mechanism be established for the planning of scientific work, in its research, educational and applied aspects, on a national basis. It is preferable that the agency responsible for this planning should draw upon the whole scientific community rather than solely from that part of the community responsible for the funding of science.

PLANNING

The planning process should be concerned with the definition of goals and the assignment of priorities for science in Canada. Two things weigh heavily here:

1. Available human and material resources within Canada.
2. The progress of planning for scientific activities in other parts of the world.

It seems obvious and is desirable that the result of this planning should be the creation of an area of excellence for which Canada could gain international recognition. The move toward an area of excellence should be based upon existing strengths in Canadian science and upon evaluation of the gaps which are anticipated in world scientific effort. It would be unfortunate to attempt to develop singular excellence in a field in which Canada would have to compete with countries which are endowed with greater resources and who already enjoy a substantial head start or are committed to the development of specific programmes. Planning should be a continuing process, providing for review and adjustment so that scientific effort may remain consistent with current conditions.

CO-ORDINATION OF EFFORT

Planning and co-ordination are necessarily related, but it should not be essential that the same mechanisms and agencies be responsible for both activities. The group responsible for co-ordination would be required to determine effective ways for the execution of agreed plans, and would have to evaluate the relative positions of universities, governments and industry.

The co-ordinating mechanism should be flexible in order that suitable provisions might be made for national, regional and individual efforts, and for recognition of these efforts.

However, there is a necessity for a single, central authority to which both the planning and the co-ordinating groups should report.

In order to co-ordinate scientific effort effectively it would be necessary to develop efficient methods for sampling the goals of the universities, governments, and industries within the scientific sphere, and to match these goals with known needs on national, regional, and local bases. An effective liaison with planning groups is an obvious necessity here.

COMMUNICATION

It is agreed that the problem of communication among all sectors of the scientific community, and between all levels, is becoming acute. Development of effective communication systems is perhaps the single most important element of a useful science policy. It is necessary to optimize the communication network by assessing the cost of fast communication and balancing this against the cost of the time loss attendant upon slower communication.

The planning and co-ordinating groups referred to above must communicate among their own members, and with others. It is necessary that channels be opened so that all elements of the scientific community may introduce their ideas to those responsible for planning and co-ordination. It is desirable that communication be facilitated in both directions.

INTER-ACTION WITHIN THE SCIENTIFIC COMMUNITY

The flow of information across the boundaries separating the university, government and industrial sectors of the scientific community has been poor. It is important that workers within these sectors be aware of what other scientists are doing in order to make efficient use of resources and avoid duplication of effort. Considerable effort must be directed to the establishment of channels through which information can flow quickly and easily from the information producer to the consumer. Canada cannot afford time lags of months or years in communicating among scientists the results of research or details of programmes in progress.

It is assumed that in the assignment of priorities for scientific development, due account will be taken of the value of such work to the community at large. For an effective science policy, it is essential that the public be made aware of the values of the scientific work being done by the country, the region, and individuals. The effective flow of information from the scientific community to the general public is presently insufficient.

FINANCIAL SUPPORT WITHIN UNIVERSITIES

Much university scientific research is pursued as an end in itself, and because of its value in improving the standards of instruction and education. The academic community will continue to demand freedom of choice in its research problems, but it is realistic to suppose that many elements of the academic community will choose problems having the most general interest. While it is difficult to classify many research problems as being either pure research or applied research, there is no fundamental reason why the university should not become increasingly involved in those types of research for which there may be an immediate application of the results.

MISSION ORIENTED AND INTERDISCIPLINARY RESEARCH

It is anticipated that national goals and priorities, as they are established will place more emphasis than is presently felt on applied research and interdisciplinary work. While the university should participate in these activities, it must be stressed that applied and interdisciplinary efforts in universities can only be built upon strong basic science departments. It follows, therefore, that the financial support of research in the pure sciences must be continued and strengthened rather than withdrawn in favour of "mission oriented" efforts.

The universities cannot ignore the expensive types of research since these may be the fields of greatest significance. It is necessary to train, in a university environment, professional people to work in these research areas. This leads directly to the conclusion that the only agency with sufficient resources to provide the necessary financial support is the Federal Government. The responsibilities for the disbursement of federal government research funds must not be delegated to provincial governments. There is, however, the necessity for provincial governments to participate in the support of research using their own funds for projects of special regional interest.

ROLE OF GOVERNMENT

The costs of research programmes include staff salaries, indirect costs, building costs, and library services, as well as the direct costs of laboratory operation. Government financial support to the present has largely been concerned with the direct costs of research programmes only, thus placing a heavy burden on the university to cover all indirect costs.

The present support available for research in the universities is neither adequate in quantity nor sufficiently broad in scope. The existing types of grants are essential and must be retained. The necessity for several new types of grants arises from the ineffectiveness of present schemes for the support of research groups within a discipline, or team projects crossing interdisciplinary boundaries.

Programmes for the planned support of new research facilities should be introduced. These might consist of substantial establishment grants for the capital cost of new facilities or the research component of new university buildings, together with the cost of research equipment necessary to make these facilities operative. Such establishment grants could then be phased out in favour of operating grants after the lapse of a suitable period of time.

REVIEWING PROCEDURES

The review and continuation of research grants must have their ultimate base in the opinions of the grantees' peers. Formal procedures should impose minimum inconvenience on all parties. It is desirable to develop flexibility in all aspects of granting policies so that the available resources may be distributed in the most effective way, taking account of the points of view of all sectors of the scientific community. Review policies should contain well defined methods for the cessation of research support to programmes which are no longer relevant or are not productive.

CONCLUSION

In order to make effective use of expensive facilities, university staff must be prepared to enter into liaison with scientists in the government and industrial sectors of the community. Any such liaisons should be consistent with the goals of all the participating individuals and with whatever science policy is applicable on a local, regional or national basis. Care must be taken to devise mechanisms for the prevention of self-perpetuating institutions, which are created for a specific job and continue after the job is completed. Care must also be taken to protect the autonomy of the university in developing its own programmes and in governing its own academic affairs. The development of regional centres of excellence, in which universities, government and industry would all participate, is an obvious kind of liaison which deserves further study.

APPENDIX 65

A Brief
to the
Senate Special Committee on Science Policy
by
Acadia University

Implicit, although not always obvious, in man's plans and projects is the larger goal of improving the quality of our lives, esthetically, culturally and spiritually. A prerequisite for progress in this aim, is the elimination of want and the provision of the basic requirements for food, clothing and shelter, and other physical needs. The degrading effects of want on the behaviour of man are well known. Esthetic and cultural values are lost. The highest flowering of these, moreover, is dependent upon a high level of economy supported by the productive efforts of our scientific and technological techniques. These in turn are dependent upon distinctive contributions from the universities, industries and governments. In this brief we are concerned with the role that universities can and should play in the future development of our country.

For many years, universities have been looked upon as store-houses or treasuries of knowledge, whose chief function was to preserve, categorize and transmit the knowledge of the day. During the latter part of the 19th century and more particularly in the 20th century, there developed, with ever increasing rapidity, the realization that a true university had a further function and that was to acquire new knowledge by research and scholarly and creative work. Finally, over the past twenty years, still another element has been added - that having to do with the application of research to the needs of society. The research

and advanced work carried on at our universities have such important implications for society that it is no longer impossible for us in academic life to confine ourselves to what might be termed pure or basic research with no thought whatsoever of application.

Under the proper circumstances, there can be no doubt that society has the right to expect that the universities which it supports be cognizant of and responsive to community, regional and national interests. In so doing, however, it is essential that the prime function of the university, that of educating students, be not neglected. The prime function of the university is then to educate young men and women; secondly, its staff members should carry on research in order to advance knowledge; thirdly, an appropriate liaison should be formed with industry and with those departments of government mainly involved in applied research and development in order to hasten and insure the application of fundamental advances. It is a belief shared by many that this liaison ought to be improved. For example, only a relatively small proportion of scientists obtaining an advanced degree accept positions in industry. Furthermore, there appears to be a relative lack of interaction and communication between scientists in university and those in industry. Some remedies suggested for this situation include the use to a much greater extent than hitherto of the so-called sandwich or work-study system of which the best known example in Canada may be that of the Faculty of Engineering

at the University of Waterloo.

Scientists in industry should be invited to present a few lectures in their special field to students and conversely, scientists in the universities should be encouraged to visit those in industry to become more fully aware of the difficulties of applying the fruits of research to the solution of production problems. It would be hoped that this interaction would foster a greater respect for those working in industry and would thus lead to a teaching environment that would not prejudice better prepared students against careers in industry. An important by-product of this interaction ought to be a greater mobility of scientists between industry and universities.

At this point, perhaps recognition should be made of the generous assistance provided by certain business firms by way of donations, very often with conditions attached for a variety of purposes, for example, for capital construction of science buildings, equipment, chairs for science professors, fellowships, scholarships and grants for both basic and applied research.

Apart from the role government is playing in helping meet the needs of society through support of the universities, the federal government through its research establishments attached to such departments and agencies as the Department of Agriculture, the Department of Forestry, the Fisheries Research Board of Canada, the Department of Fisheries, the Department of Health and Welfare, the Department of National Defence, the National and Medical Research Councils, etc. provides a great deal of support for both fundamental and applied research and indeed, development. The extent to which

these establishments interact with industry and universities varies widely, but in certain cases, for example the Fisheries Research Board, all three components are well represented and a determined effort is made to maintain such a relationship that the fruits of both basic and applied research are exploited by appropriate development in industry. Such interactions have been greatly facilitated by the establishment of some of the federal research institutions on or near university campuses.

This has been done for a variety of reasons, but undoubtedly in the hope that somehow or other there would develop a symbiotic relationship between such institutions situated in close juxtaposition to one another. As always in such relationships, if they are to become and remain viable, (1) There must be a continuing advantage to both partners. (2) There ought not to be any exchange of funds to have the government-supported investigator present a few lectures in his field or to have a university-supported investigator cooperate in certain research work being carried on at the government institutions. (3) Similar salary scales for eleven months of work should obtain for equivalent personnel in the university and government-supported institutions.

In any method of cooperation that may be devised for university, industry, and government to meet the needs of society - whatever these may be or however these are defined - certain criteria must be met. Governments through their departments and agents must

fulfill the mandates as prescribed by Parliament; industry to survive must make a profit; the university must fulfill the functions and role determined for it by its appropriate governing bodies. Within these restrictions, it is essential that all three sectors work together to help meet more effectively than in the past the needs of society.

It is our view, that in order for the universities to play their role adequately, the national government should become directly involved in their support and any attempt to provide this support on the basis of the amount of graduate work and research performed is sheer sophistry.

The provision in the British North America Act for exclusive provincial rights in education in so far as it applies at the level of tertiary education, must surely be described as an accident of history. In the December, 1968 issue of the Bulletin of the Canadian Association of University Teachers, R. D. Michener calls attention to the fact that at the Confederation Conference at Charlottetown in September of 1864, university education was reserved as a responsibility of the central government but one month later at the Quebec Conference, this power was placed in the hands of the local legislatures and subsequently retained in the BNA Act.

It should be recalled that at the time of Confederation there were only a few small colleges in Canada and there is no

indication that the Fathers of Confederation gave serious thought to the state of higher education or to the implications of its development on the future of Canada. Furthermore, at that time our country was comprised of widely separated, sparsely populated areas, connected by modes of travel that were slow and tedious. It must be surely apparent that what little attention was paid to the matter of education was concentrated on the local or provincial aspects of primary and secondary education and with due regard for religious rights in this area.

Despite the great emphasis placed upon the provision in the BNA Act with regard to the exclusive jurisdiction of the provinces in the field of education, as one might expect in a situation where it is completely clear that the lack of a federal role in this activity is not consonant with the nation's best interest, a number of measures, largely of a stop-gap nature, have been instituted to circumvent or break through this stricture. The first federal grants made for education to the provinces were made under the provisions of the Parliamentary enactment passed in 1912 for the broad purposes of "supplementing and extending the work of agricultural education and for the improvement of agriculture." Since that time, in a variety of ways, the federal government has entered this field. The most important and far reaching of these was the introduction of the per capita grants system support by the St. Laurent government in the early 1950's.

It is obviously impossible for every province in the country

to provide adequate opportunities in university education to its residents. For example, up to only about 20 years ago half of the provinces in our country had no medical school and even today, three of the ten provinces are still without one. Thus the main responsibility for providing medical doctors for the entire nation, up until a little over a decade or so ago, had to be accepted by five provinces. This is a most anomalous situation, especially when one considers that the federal government has not, and does not yet provide appropriate support to these schools. One might well speculate, or ask at this point, to what extent the lack of formal federal or constitutional involvement in higher education has impeded the development of the universities and consequently of Canada as a whole. Certainly, no one can deny that the universities have fallen behind in their efforts to provide adequate facilities for teaching and research for the numbers of students who are now seeking higher education. This is especially true of medical education. Canada has failed in its task to meet the demand for medical doctors.

What has been said with regard to medical education applies to a greater or lesser degree to a variety of other disciplines. The fact that the federal government in October, 1966, withdrew its direct support for the financing of university work and transferred this support entirely to the provinces, has made it necessary for the planning of higher education at least on a province-wide

basis. It is obvious, too, that there is a great need for the same sort of planning, cooperation, and coordination in the provision of facilities for relatively expensive professional or other faculties on a regional basis. This obviously ought to involve not one, but several contiguous provinces since no one province, certainly in the Atlantic region at least, is large enough to provide for a complete offering of degree programs in university education. The point should also be made that when provincial governments have the responsibility of providing the major financial support to universities there will be a danger that conditions will be imposed creating a barrier for out-of-province students. Furthermore, this circumstance may prevent a student from being given an opportunity to take a specific degree programme. The only acceptable solution is one enabling Canadian students to be considered for admission to any university in the country regardless of their official provincial origin or residence.

It is well recognized that universities have not only a provincial function but a national, and indeed an international one. If we continue to regard the support from governmental sources as being purely a provincial responsibility, inevitably the provincial interests served by these institutions will be promoted to the detriment of those of national and international significance.

The enrolments of our universities should be drawn not only from every province in Canada but also from a good many foreign countries. No one would argue the importance of this circumstance,

yet by no stretch of the imagination can this be looked upon as serving a provincial interest. Even in the case of students attending institutions within a province of which they are resident, after graduation, being the most mobile component of our work force, many of them cross provincial boundaries not once, but several times during their career.

To sum up, I look upon an increasing involvement of the federal government in the financial support of higher education as not only justifiable but essential, if Canada is to keep or to advance her position in the hierarchy of nations in the years ahead. Failure to make appropriate provisions in this regard can have but one inevitable result - the relegation of Canada and Canadians to increasingly subservient roles in future world affairs. It was no less a distinguished person than the Father of Confederation, Sir John A. MacDonald, who in 1872 wrote a letter to Egerton Ryerson, " . . . The subject of education has been withdrawn unwisely as I have always thought, from the control and supervision of the general government." This is a statement that is as valid today as when Sir John A. MacDonald first made it, and I would hope that we will soon see established a clear and consistent policy in the field of higher education - not necessarily nationalization of our universities but direct substantial support of our institutions by the central government.

The thesis that research resources should be concentrated in a relatively small number of large institutions, the so-called centers of excellence idea, is one that ought not to be accepted unquestioningly or at least in the sense that this approach should be implemented to the exclusion of all others. The history of scientific discovery is replete with the important advances made by scientists working essentially alone. Although it is agreed that there are certain advantages in the group approach, our resources should not be so allocated that there is no place or support for the individual scientist working in a relatively isolated manner. We believe, therefore, that those working in this way should be given support within the reasonable limits imposed by the need to avoid the undesirable duplication of expensive facilities. If appropriate support is not forthcoming for those scientists who prefer to work in such an environment, science in the smaller universities will be crippled and the deleterious effects will not be confined to science faculties but will be felt throughout. Furthermore, the recruitment of students as research scientists would also inevitably suffer. It is recognized that there are practical limits to the amount of money Canada can devote to fundamental research and that a balance between resources applied to research and development must be reached such that our industries will be able to compete effectively in world markets.

Finally, although most of the foregoing remarks have been just as applicable to the natural and physical sciences as to the humanities and social sciences, it must surely be recognized that by any standard of comparison our record of support for the latter has been abysmally poor. If we are to reap and to enjoy the fruits of our research and development in the realm of science and technology, it is patently obvious that comparable advances must be made in the humanities and social sciences. Only in this way can we look forward with confidence to an improvement in the quality of our life.

Respectfully submitted by Dr. J. M. R. Beveridge,
President of Acadia University, on behalf of
some of his colleagues in the Sciences, Social
Sciences, and the Humanities.

March 12, 1969

APPENDIX 66

Brief
to the
Special Committee on Science Policy
from the
Faculty of Science,
University of New Brunswick

February, 1969

M.D.B. Burt, Associate Professor of Biology, Chairman
G.E. Pajari, Associate Professor of Geology
I. Unger, Assistant Professor of Chemistry
C. Young, Assistant Professor of Physics

Summary of the Recommendations and Conclusions

I. First, we strongly recommend that Federal funds to support scientific research in universities should be substantially increased for the following reasons:

(a) The quality of university scientific research is high while the contribution of university scientists to scientific knowledge is substantial and has been made at modest cost.

(b) Only by increasing the number of graduate students can Canada continue to improve standards of education, government, and research at all levels. This improvement of standards, by upgrading scientific positions in most fields, is essential if Canada is to remain a technologically advanced country.

(c) As it is impossible to predict through foresight, which basic research will have useful application at a later time, the continued investigation of basic problems in universities is utterly vital and invaluable to research in its broadest sense and to the eventual success of applied research.

(d) It is vital to our national cause to possess and continually increase the body of research scientists not only for their productive capacity and output of new knowledge, but also for their expertise and technical know-how. This body is the only one available to focus on any problem, fundamental or technical, of national concern.

Brief to the Special Committee on Science Policy
from the Faculty of Science, University of New Brunswick

Introduction

1. In Canada, as in many other countries, a large number of highly qualified scientists are doing research in universities. In view of the increasing demands being made on Federal funds to support research and development in several different spheres we welcome this opportunity to present a short brief outlining what we believe to be the most cogent arguments for not only continuing, but even increasing financial support of scientific research in Canadian universities.

University research financing

2. Canada is unique in that almost all funds supporting science research in universities are provided either directly or indirectly by the Federal Government and most are dispensed by a single body, namely the National Research Council of Canada. Once these funds have been allocated by the Government, the method of administering them is both well known and highly respected throughout the world whereby the most eminent scientists in Canada assess the merit of each applicant, including his research, and divide such funds as are available in proportion to the quality of the work being done. It is our firm belief that this is the best possible method, both for long term and short term planning, in so far as university scientists are concerned. We further believe that there should be no unnatural bias in this assessment in the form of priorities at this level and that individual merit remain the criterion in the allocation of grants. The policy or attitude adopted by N.R.C. in this method of awarding grants has been held in high esteem by university scientists in other countries for many years and, furthermore, has attracted them to Canada.

This can do nothing except raise the general standard of university education, raise the standard of research, and at the same time increase the body of available expertise in Canada.

3. It is clear that within the past two years, however, the sums of money available to N.R.C. and other Federal award giving agencies have not increased in proportion to the increased demands. These increased demands are caused both by an increase in the number of applicants and by the natural growth of many research programmes in relation to graduate schools. This proportional decrease in funds could effectively stifle many qualified researchers within universities thus limiting seriously the amount of research possible. Furthermore, it not only affects adversely the research potential of the university scientist but at the same time limits the amount of research which might have been done by graduate students. Even more serious consequences are the actual reduction in the total number of graduate students and the possible emigration of many of our best research scientists. Thus, even a slight decrease in funds of this sort can have profound and far-reaching effects on the total contribution of universities. We are aware that some estimates have been made regarding the number of Ph.D. graduates produced and the number of positions available and that in one set of figures it would appear that the supply will exceed the demand this year. We feel that such an estimate should be vigorously challenged as it seems most unlikely that such a situation could possibly exist. The demand for better qualified scientists will surely always be greater than the demand for lesser qualified scientists assuming that candidates in both

categories are available. It is obvious, for example, that in the United Kingdom where the output of Ph.D. graduates is high, this is reflected not only by a higher percentage of better qualified scientists engaged in research and development, but also in the higher percentage of better qualified scientists in other jobs such as high school teaching. In the whole of the Atlantic Provinces there are only two high school teachers with a Ph.D. and whereas we would expect the situation to be considerably improved in the more highly developed parts of Canada, this still does not compare with the situation in the United Kingdom where the proportion is considerably higher. In those jobs now, where training to the M.Sc. level is deemed sufficient, it would seem both reasonable and desirable that with a continuing supply of Ph.D. graduates, there would be a continuing improvement of standards. It is only relatively recently, for example, that a Ph.D. degree became a prerequisite to permanent employment in science departments of Canadian universities. Similarly, in many research institutions there are still competent scientists doing competent work without a Ph.D. degree and yet now all present appointments to research staff must have this degree. We consider such a situation, where the standards continue to rise across the board, to be both highly desirable and in many ways inevitable in a country such as ours where the standard of training in all other walks of life also continues to improve.

In this light, then, we consider that any planned reduction in the number of Ph.D. graduates could be regarded in the same way as a planned reduction in the number of M.S. graduates and, by extension, even to the number of B.Sc.

graduates. Such a consideration would be retrogressive in the extreme. Even as the situation currently exists, the number of graduates at the bachelor level in science and engineering is "only about 19% of the total and is projected as a declining population"¹ over the next decade. This is particularly distressing in view of the increasing variety of positions which demand a scientific education as our Society evolves industrially and technologically.

University scientists

5. A point often ignored in surveys based only on numbers of bodies involved in research, but one which we feel is extremely pertinent to any discussion, concerns the quality as well and the quantity of research accomplished as well as its relationship to cost. While the quality of research can, in most cases, only be judged subjectively it should be recognized, nevertheless, that one of the main criteria used in making appointments to science faculties in universities is the ability of the applicant to do research. This effectively selects a uniformly high standard of research competence along with high academic qualifications for both are essential to teaching many undergraduate, as well as graduate, courses. There is yet another selection factor involved, at least in relation to those university scientists engaged in research and receiving Federal funds, and this is perhaps the most poignant, and most neglected, factor of all; namely, that those doing research are doing it because they really want to. While there is encouragement, there

¹Special Study No. 6. Background Studies in Science Policy: Projections of R & D Manpower and Expenditure. Jackson, Henderson & Leung.

is no actual compulsion to do research in most Canadian universities and, accordingly, those university scientists who do not wish to become involved in research per se can utilize their talents in some other way. In so far as the cost of university research is concerned, it has already been pointed out by the Science Council that while the contribution to knowledge made by university scientists is high, the cost is relatively modest. The low cost may well be due to the fact that in many cases private income is frequently used to fill out Federal grants which cannot quite stretch otherwise to cover the cost of the research in progress. The relatively rapid dissemination of newly acquired knowledge in universities is yet another important factor as it leaves much less room for any unnecessary duplication of research. When good results are obtained, they are usually immediately published and they can thus, due to their accessibility to all other scientists, be used as new starting bases for further research.

6. It is possible, therefore, to categorize university scientists, who receive Federal support for their research, in the following way:

1. He must satisfy his own university regarding academic qualifications and research potential to justify his initial appointment.
2. He must satisfy experts in his own discipline, through N.R.C. selection committees for example, regarding both his research capabilities and the merit of his research.
3. He must further satisfy such experts every year he applies which thus imposes a continuous check on his research.

4. He must be utterly dedicated for him to make the sacrifices necessary to do the extra work involved. (Otherwise, why would he voluntarily apply each year for more work the following year?)

Relationship of universities with Government and industry

7. For many years research has frequently been divided into two categories; namely, fundamental or pure research as opposed to applied research. We believe, as do most serious scientists, that this is an utterly invidious type of separation as in many cases it is impossible to differentiate between them. Thus, any comparison between the amounts of funds supporting fundamental research and those supporting applied research can be thoroughly misleading. This is particularly true if comparisons are made between different countries in view of the fact that certain projects being tackled in the United States of America are there classified as applied research whereas the same projects being tackled in Canada, even by the same investigator, are here classified under the heading of pure research. This further emphasises that the distinction between the two types of research is neither a clear-cut nor an obvious one; and, furthermore, these terms are becoming more meaningless in view of the rapidly decreasing time-lag between the discovery of basic information and its incorporation into practical application. The fact that this time-lag is becoming so short, moreover, is a most alarming one as it indicates all too clearly that fundamental research is not being carried out at a rate proportional to that of applied research. In several areas already, it is all too evident that advances in applied fields are being restricted due to the paucity of fundamental

knowledge in those fields. A single piece of scientific information which can be applied immediately to practical use has often been compared with the apex of a pyramid; and in the same way that the pyramid apex depends on a considerably larger foundation, so does any piece of practical scientific information depend on a considerably larger volume of fundamental scientific information. We believe, therefore, that it is imperative that fundamental research receive more financial assistance.

8. In view of the quantity of fundamental research necessary for it to make any significant contribution to industry, it is hardly surprising that in most cases industrial agencies are reluctant to provide funds for such research even within their own laboratories. It is thus no less surprising that industry in general does not provide appreciable research funds for university research in this country and, consequently, the burden of support for this type of research falls on the Federal Government. It is our sincere and earnest hope that the Federal Government will continue to operate through the National Research Council and that the actual method of meting out support for individual scientists be left in the hands of those experts who are in the best possible position to determine the true quality of the research being done. We would also strongly recommend that N.R.C. and the other Government award granting bodies be placed in a better position, through an increase in available funds, to serve this vital and important facet of Candaa's requirements.

9. The fact that universities are virtually the only institutions where the type of research only needs to be justified in relation to its quality not only insures that it be of a high standard but also serves as a valuable attraction to many potentially great scientists. However, it should go without saying that the interest of serious scientists will be caught and held by serious problems of national importance. The exact titles of individual research projects will no doubt be influenced by the dissemination of information on specific problems, whatever the source of the problem may be. What is needed more than direct changes of policy is the establishment of broader and more numerous lines of communication between Government, Industry and University.
10. In so far as the apportioning of Federal funds between industrial, Governmental applied research, and university research is concerned, we recognize the importance of support in all three areas. We find it difficult, however, to ignore the stand taken by industry that university research should be reduced in order to promote industrial research and industrial growth. The present low figure of support for universities is not enough to support faculty research as well as the training of graduate students, even assuming that it continues at the same rate of increase, but to suggest that it is sufficient to allocate some of this support towards some other type of research is paramount to denying the place universities have in modern society. If the argument is sound, that industrial growth and development should be substantially financed by Federal funds, then this should be done by increasing that proportion of the Gross National Product which is allocated to Research and Development.

The fact that Canada spends proportionally less than many of the O.E.C.D. countries (U.S.A., U.K., France, Netherlands, Japan, Sweden, and F.R. Germany) on research and development further supports this view. However, development of this type should be evolutionary rather than revolutionary and, as suggested earlier, might best be initiated through co-operative programmes involving scientists from Government, industry, and universities. It should be stressed, however, that any such co-operative programmes be financed by additional funds and that these ventures not be envisaged as replacements for existing university programmes. We would suggest further that for Canada to derive optimum benefit from support of industrial development, preference should be given to Canadian-owned companies. The findings of the Watkin Report (which showed, based on data from 743 of the largest Canadian operations, over 60% of the profits accrued to non-residents) we find staggering if not alarming and would welcome some reassurance from the Government that it does not intend to subsidize foreign research and development at what would be the expense of truly Canadian research and development at this time.

11. Finally the presence in Canada of many research organizations whose prime concerns are in one or other of the areas of applied research, automatically assures the continued investigation of any problems of immediate practical importance. Such problems, in their eventual elucidation, should clearly involve co-operation between different scientific groups should the particular expertise be spread in different institutions. However, these co-operative programmes should be financed in addition to existing programmes as far as the university's contribution is concerned. Bodies such as Canada

Department of Agriculture, Fisheries Research Board, Department of Mines and Technical Survey, Geological Survey of Canada, Defence Research Board, and others, must obviously have sufficient funds for them to fulfill their expected role in contributing to the improved economy of the country. It is equally clear, however, that this again should not be at the expense of university support whose overall contribution in terms of research itself, education, and the specialised training of graduate students is perhaps the most fundamental and vital contribution of all. Accordingly, we strongly recommend that the Government allocate more funds in total percentage of the Gross National Product to Research and Development as a whole, and that in particular, more substantial support of university research and graduate training be provided.

CURRICULUM VITAE

Name: Michael David Brunskill BURT

Date and Place of Birth: January 19, 1938; Colombo, Ceylon

Martial Status: Married, with four children

Position: Associate Professor

Department: Biology

Institution: University of New Brunswick

Degrees and Qualifications: B.Sc. (First Class Honours) in Zoology
with Parasitology as special subject.
University of St. Andrews, Scotland, 1961.

Ph.D. for a thesis entitled "Parasitological
Studies".

University of St. Andrews, Scotland, 1967

F.L.S. elected in 1966.

Academic and Research Experience:

1956-1957 University of St. Andrews, Scotland.

1957-1958 Union College, Schenectady, N.Y., U.S.A. on a C.
Vreeder Scholarship

1958-1961 University of St. Andrews, Scotland.

1961-1962 Assistant Professor, Department of Biology,
University of New Brunswick.

1962 (summer) Research Assistant to Dr. T. W.M. Cameron,
Institute of Parasitology, Macdonald College,
P.Q.

1962-1964 Research student and senior demonstrator,
University of St. Andrews, Scotland.

1963 (summer) British Council Research Scholarship for study at
the Université de Neuchâtel, Switzerland under the
direction of Professor J. G. Baer.

1964-1968 Assistant Professor, Department of Biology,
University of New Brunswick.

1968-present Associate Professor, Department of Biology,
University of New Brunswick.

Number of Publications: Nine, on Parasitology

Special Committee

CURRICULUM VITAE

Name: George Edward PAJARI

Date and Place of Birth: March 24, 1936, Montreal, Quebec

Marital Status: Married with two children

Position: Associate Professor

Department: Geology

Institution: University of New Brunswick

Degrees and Qualifications: B.Sc., McGill University, 1958

M.Sc., Cambridge University, 1962

Ph.D., Cambridge University, 1967

Academic and Research Experience:

1964-1965 Lecturer, Department of Geology, University of
New Brunswick

1965-1968 Assistant Professor, Department of Geology,
University of New Brunswick

1968-present Associate Professor, Department of Geology,
University of New Brunswick

Research Speciality: Physico-chemical parameters involved
in differentiation of Igneous systems.

Number of Papers: Four

CURRICULUM VITAE

Name: Israel UNGER

Date and Place of Birth: March 30, 1938, Tarnow, Poland.

Martial Status: Married with one child

Position: Assistant Professor

Department: Chemistry

Institution: University of New Brunswick

Degrees and Qualifications: B.Sc. Sir George Williams University,
1958

M.Sc. University of New Brunswick,
1960

Ph.D. University of New Brunswick,
1963

Academic and Research Experience:

1963-1965 Postdoctoral Fellow, Department of Chemistry,
University of Texas

1965-present Assistant Professor, Department of Chemistry,
University of New Brunswick

Member Chemical Institute of Canada

Chairman, Chemical Subcommittee, APICS

Number of Publications: Fourteen

CURRICULUM VITAE

Name: Charles YOUNG

Date and Place of Birth: December 4, 1933, Belfast, Northern
Ireland

Marital Status: Married, one child

Position: Assistant Professor

Department: Physics

Institution: University of New Brunswick

Degrees and Qualifications: B.Sc., Queen's University, Belfast,
Northern Ireland, 1955

M.Sc., University of Toronto, 1958

Ph.D., University of Michigan, 1964

Societies: American Meteorological Society
Canadian Meteorological Society
Canadian Association of Physicists

Member of National Research Council Subcommittee on
Meteorology and Atmosphere Science

Academic and Research Experience:

1961-1964 Assistant Research Meteorologist, Department of
Meteorology, University of Michigan

1964-1965 Associate Research Meteorologist, Department of
Aerospace Engineering, University of Michigan

1965-1967 Assistant Professor, Department of Meteorology
University of Michigan

1967-present Assistant Professor, Department of Physics,
University of New Brunswick.

Number of Publications: Five

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